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ABSTRACT

The study reported here provides a theoretical and empirical framework for the analysis of employment tax credit policy (a government subsidy or business tax credit to firms who maintain or expand their use of labor). Various programs are examined from the standpoint of structure and implications. The programs are selective employment incentive; foreign employment credit, broad-based employment credit, and the new jobs tax credit. Literature is reviewed pertaining to economy-wide programs, including selective and broad-based employment credit programs. The effects of employment tax credits on individual firms are also examined. Then, the aggregate implications of employment tax credits are analyzed from the perspective of a complete macro-economic model of the economy. The model includes various employment tax credit parameters and accommodates several alternative methods for financing the program. Also included is an empirical evaluation of the impact of an employment tax credit on the U.S. economy and a comparison of the cost of the program with public service employment alternatives. Appended are explanations of aggregate formulation, consumption calculation formulas, and references. Flow charts, tables, and other graphics illustrate many key points. (Author/CT)

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An Investigation of the Conceptual and Qualitative Impact of Employment Tax Credits

GARY C. FETHKE,
ANDREW J. POLICANO,
AND SAMUEL H. WILLIAMSON

August 1978

W.E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH

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FOREWORD

The employment tax credit presents an important alternative to economic policies based on the management of aggregate demand. Professors Fethke, Policano, and Williamson have explored the implications of the employment tax credit as a supply-management prerogative and have analyzed the potential costs and benefits which may develop from such a program. The Institute is pleased to publish the results of their research.

By integrating their analysis of employment tax credit policy from the standpoint of the individual firm into a macroeconomic schema, the authors provide a unique view of the effect of employment tax credits on the entire economic system. The data, both qualitative and empirical, developed through this framework of micro and macroeconomic theory should thus be especially significant to those involved in employment research and policy.

Facts and observations expressed in the study are the sole responsibility of the authors. Their viewpoints do not necessarily represent positions of the W. E. Upjohn Institute for Employment Research.

E. Earl Wright
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August 1978

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PREFACE

Most contributions to the formulation of aggregate economic policy consider the effectiveness of traditional demand-management monetary and fiscal policy. This approach seeks to influence employment, unemployment, and the rate of inflation by altering the demand for goods and services by consumers, business, and government. The most widely used demand-management tools include changes in government spending, changes in tax rates, and changes in the money supply. The predominant emphasis on demand oriented strategies derives from the neo-Keynesian scenario which links fluctuations in real output and employment directly to disturbances in the level of aggregate demand. In recent years, simultaneously high unemployment and inflation have led to a growing disenchantment with demand-management monetary and fiscal policies. One reaction has been the adoption by numerous developed economies of various supply-management fiscal programs. These policies are intended to directly stimulate employment during recessionary periods without initiating an increase in inflationary pressure. Advocates also claim that supply-side fiscal programs are more cost effective than traditional demand-management programs in creating jobs for the unemployed.

The employment tax credit is an important form of these newer supply-management programs. In general, the employment tax credit seeks to stimulate employment and real output by providing a credit against income or payroll taxes to firms which increase their use of labor beyond some prescribed base level. While employment credits have been enacted in numerous economies, including the United States, there is little conceptual analysis that develops their aggregate short-run implications. In particular, very little is known about the transmission mechanism of supply-management policy and the relative effectiveness of these programs when compared to demand-management policies. In addition, important questions at the level of an individual firm concern the potential effect of tax credits and wage subsidies on employment decisions. Will firms respond to these programs by increasing employment, particularly during periods of decline in aggregate economic activity? Questions also develop concerning the impact of employment tax credits on the composition of labor services. For example, what are the effects of this program on part-time workers, on the average length of the work week, and on the various skill classes of workers? As with any fiscal program, there are also the practical problems of administration and implementation.

The purpose of this study is to provide a theoretical and empirical framework for the analysis of employment tax credit policy. The structures of the various programs in the United States and other countries are examined, and the implications of these measures are developed in the context of explicit microeconomic models of firm behavior. Then, the aggregate implications of employment tax credits are analyzed from the perspective of a complete macroeconomic model of the economy. The model not only includes various employment tax credit parameters, but also accommodates several alternative methods for financing the program. The final portion of the study includes an empirical evaluation of the impact of an employment tax credit on the United States economy and compares the cost of the program with public service employment alternatives.

The authors wish to express their appreciation for the assistance offered by several individuals in the preparation of this study. Specifically, we are indebted to Dr. E. Earl Wright and Susan Friedman of the W. E. Upjohn Institute for Employment Research for encouragement and editorial assistance. We are also grateful to Professor Daniel Hamermesh and Professor Carol Fethke, who reviewed the manuscript and offered a number of helpful suggestions for improving the content. Finally, we appreciate the help of Carol Skripsky and Laura DuBoff, whose excellent skills were instrumental in the preparation of the manuscript.

Gary C. Fethke, Andrew J. Policano,
and Samuel H. Williamson

Iowa City, Iowa
May 1978

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1. INTRODUCTION

Stabilization attempts to alleviate transitory unemployment traditionally consist of demand-management monetary and fiscal policies. The rationale for the almost exclusive use of demand-side policies derives from the neo-Keynesian concern for inadequate aggregate demand as an explanation for economic recessions. In contrast to the Keynesian approach, several economies have recently implemented various forms of short term, supply-management policies. In general, these measures seek to affect employment and real output by providing direct incentives to firms in the form of government subsidies or tax credits. Can it be that the newer supply-management fiscal measures are a legislative response to a set of economic forces that don't fit neatly into the Keynesian paradigm? Can we expect macroeconomic adjustments from these programs that cannot just as easily be achieved using standard monetary or fiscal policy? These are the primary questions addressed in this study.

1.1 The Employment Tax Credit

The most common type of short term supply-management policy is an employment tax credit.[1] While there are numerous variants, the basic form provides a government subsidy or business tax credit to firms who maintain or expand their use of

labor. The credit is most frequently applied to either some percentage of the firm's wage bill or to the number of employees. The program is intended to be short term in nature and more or less universal in coverage. This contrasts, therefore, with selective credit plans that seek to subsidize the employment of particular members of the workforce, particular regions of the economy, or possibly, particular industries. Also, the employment tax credits are not designed to provide a permanent subsidy to labor, nor are they necessarily intended to encourage long-run substitution of labor for capital.

What are the possible attractions of employment credit programs? On the supply side of the economy, the basic rationale for an economy-wide employment credit is that it will permit the fiscal authority to directly influence the real cost of labor services. In particular, during downturns in business activity, an increase in the credit can lower the effective cost of labor and thereby induce firms to maintain and possibly increase employment and real output. During periods of abnormally high employment and inflation, a negative credit (tax) can be implemented. On the demand side, the credit can be formulated to influence aggregate spending levels of households and business. Since the program affects both aggregate supply and aggregate demand, it is possible that employment credits can be used to stimulate employment without precipitating an increase in the inflation rate.

The extent and breadth of coverage of employment credits can potentially exceed that of the popular investment tax credit. Specifically, an employment credit will affect more firms in the economy, including smaller establishments and service industries that use labor-intensive production and marketing processes. Also, the investment tax credit is generally limited to specific types of capital expenditure; the employment tax credit, however, can be applied to all types of labor services. Further, there is considerable evidence that employers can adjust their use of labor services to changes in the real cost of labor much faster than they can adjust capital purchases to changes in the cost of capital induced by the investment tax credit. This implies that employment credits will have a more immediate impact on the

economy than will an equivalent-cost investment tax credit program.

1.2 The New Jobs Tax Credit

After considerable Congressional debate, an employment tax credit program was introduced into the United States economy in 1977. The New Jobs Tax Credit, which became law as part of the Tax Reduction and Simplification Act of 1977, is a wage-bill credit that reduces the income tax liability of eligible firms. The credit is offered to firms whose wage bills exceed a prescribed base level. The major features of the New Jobs Tax Credit, which will be discussed in detail in chapter 2, are that (1) it provides a relatively large per-worker credit for net increases in employment—that is, it is a "marginal employment tax credit;" (2) it is temporary in that the legislation extends only through 1978; (3) there is a ceiling on the total amount that can be earned by an individual taxpayer; and (4) the credit is proportionately related to the number of additional employees a firm acquires.

The major emphasis of this study is the examination of the likely response of individual firms, as well as the potential reaction of the economic system, to the implementation of an economy-wide employment tax credit program. The analysis shows that the specific features of the New Jobs Tax Credit have important implications for both the magnitude and direction of these responses.

1.3 The Impact of the Employment Tax Credit on Individual Firms

The individual employer's reaction to a change in the employment tax credit parameters depends on the responsiveness of the demand for labor to changes in the cost of labor, the ability of firms to substitute hours per week for numbers of employees, and the state of the economy. The analysis characterizes the demand for labor by assuming that firms "produce" labor services by combining the number of employees with the number of hours per period. This characterization allows explicit

derivation of input demand functions for hours and employees. In general, these demand functions depend on the standard wage cost and an imputed rental price per employee. The imputed rental price per employee includes factors such as hiring and training costs that do not vary with the number of hours worked.

Employment tax credit programs can affect the demand for labor services through their impact on the wage rate and the imputed rental cost of labor. Given representations for those demand functions, it is possible to analyze the qualitative responses of firms to changes in the cost per man-hour, the imputed rental cost of employees, and the various types of employment credits. These responses suggest the likely reactions of an individual firm to initiation of one of the several forms of employment tax credits, including the New Jobs Tax Credit.

Analysis of the behavior of individual employers indicates that employment credits can have quite different effects on firm and household behavior, depending on whether the credit is applied on a per-employee basis or a per-man-hour basis. For example, a per-employee credit may encourage firms to increase hires of part-time workers. On the other hand, a credit applied to the man-hour component of labor cost may induce firms to increase the hours of labor services while reducing the number of employees.

The establishment of the program base is also quite important in determining the firms' response to the employment credit program. The base of an employment tax credit program is the prescribed level of employment, or wage bill, beyond which a firm becomes eligible for receipt of the tax credit. The analysis indicates that improper specification of the base may precipitate an unfortunate destabilizing feature of the New Jobs Tax Credit. Consequently, alternative strategies for setting the base are considered in the analysis.

1.4 The Impact of the Employment Tax Credit on the Aggregate System

Most existing conceptual analyses of the employment tax credit focus exclusively on the effects of the credit on firm or household behavior. These analyses represent only a partial investigation of the impact of the credit program. In particular, many of these studies ignore the role of government financing and the feedback effects of decreased transfers and increased tax revenue that are caused by increases in the credit. To determine the effects of the employment tax credit program on aggregate output, employment, and the price level, it is necessary to develop a model of macroeconomic behavior. Further, it is important to examine the sensitivity of the macroeconomic response of the program to different methods of government financing.

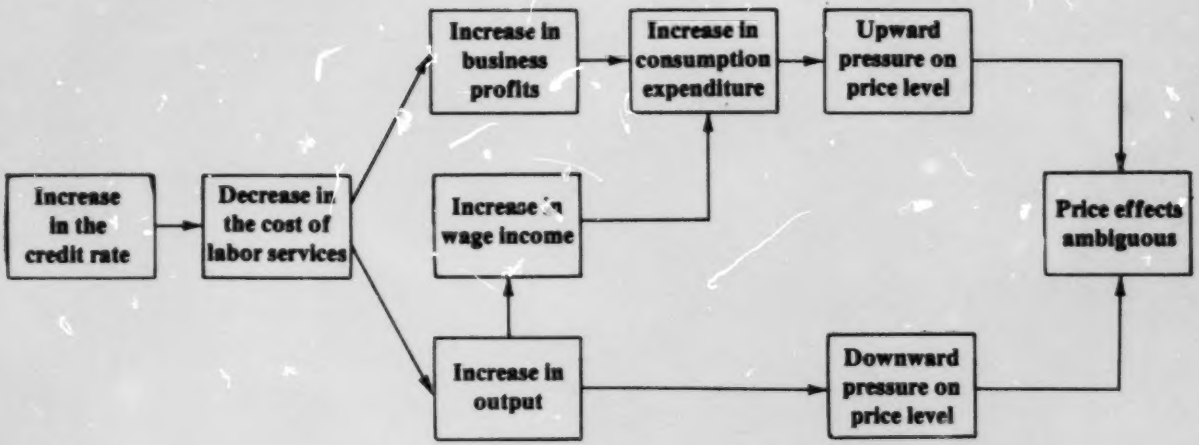
The first step in developing an aggregate framework is a characterization of the microeconomic behavior of individual agents in the system. The aggregate formulation used in our analysis builds upon the behavioral aspects of households, business firms, and government agents. The activities of these individual agents are combined into a complete analysis of the money, commodity, and labor markets. Of particular importance to our understanding of the consequences of the employment tax credit are the properties of the demand for labor and the supply of labor and their interaction in determining employment and the wage level. The demand for labor and the supply of labor are described as functions of the real wage. Specifically, an increase in the real wage reduces the quantity of labor demanded and increases the quantity of labor supplied.

There are several rationalizations for the existence of unemployment. One interpretation of "Keynesian" unemployment is that output is demand determined. In this case, downturns in aggregate demand directly cause decreases in output as firms tend to produce only the amount they can sell. A second view is that unemployment occurs when disturbances to the aggregate system cause a rise in the real cost of labor services. This rise induces firms to decrease their demand for labor services while

households increase their supply. The resultant excess supply of labor places downward pressure on wages. If wages were completely flexible, the adjustment in wages would relieve the excess supply of labor and restore equilibrium at the initial level of employment. Realistically, wages tend to be sticky, especially in the downward direction. Consequently, when the real cost of labor rises, firms respond by laying off workers and thus decreasing output. This second view of unemployment is the one that characterizes the macroeconomic model used in this study. The results of the analysis are also compatible with the "Keynesian" (demand-determined) view of unemployment if the demand for labor shows some sensitivity to changes in the real cost of labor services.

An employment tax credit can be implemented during periods when the rising cost of labor services and the persistence of wage stickiness combine to induce firms to lay off workers. An increase in the credit rate reduces the cost of labor and thereby increases the demand for labor and real output. By directly increasing output, the employment tax credit places downward pressure on the price level. The credit also affects aggregate demand for commodities. Initially, an increase in the credit rate increases business profits, which are eventually received by households in the form of increased dividends. Also, secondary effects through the multiplier process tend to increase wage income. The rise in household disposable income results in an increase in consumption expenditure. Thus, the credit implies an increase in aggregate demand, which exerts upward pressure on the price level. Because an increase in the credit increases both aggregate supply and demand, the overall effects of the program on the price level are ambiguous. It should be noted, however, that to stimulate an increase in employment and output, the price level need not increase. This result is an important aspect of supply-management fiscal programs that distinguishes them from traditional demand-management measures. The macroeconomic effects of an increase in the credit rate are summarized in figure 1.1.

Figure 1.1 The Macroeconomic Effects of an Increase in the Credit Rate


Increase in the credit rate
Decrease in the cost of labor services
Increase in business profits
Increase in wage income
Increase in output
Increase in consumption expenditure
Upward pressure on price level
Downward pressure on price level
Price effects ambiguous

Another feature of the aggregate formulation is the incorporation of alternative strategies for government financing of the employment credit. Our analysis investigates the macroeconomic response to the credit when financed by increasing the deficit, increasing taxes, or reducing government expenditure. The predictions of the model indicate that an increase in the credit rate will increase employment and output under all three alternatives. Although the response of the rate of inflation is less certain, the program can precipitate a decline in the rate of inflation under plausible circumstances. The specific method chosen to finance the program will depend on the state of the economy, with some forms more suitable for mild recessions and other forms more suitable for severe downturns in economic activity.

Finally, we present numerical estimates of the impact on employment and other macroeconomic variables of a wage credit program implemented for several bases and various strategies of finance. These estimates are obtained by using realistic parameter values (based on 1976 data) in the behavioral relationships of the conceptual framework. The use of this data allows analysis of the likely effects of the credit program had it been implemented during 1976. Our estimates indicate that the implementation of a credit program during 1976 would have significantly increased employment while simultaneously slowing the rate of inflation. The numerical calculations also indicate that the employment tax credit program would have created jobs at a smaller cost to government than either public service employment, tax reductions, or direct government expenditure. One of the main contributions of this analysis is to explicitly incorporate the feedback effects on net government revenue of the increase in income taxes and the decrease in transfers generated by the credit program.

1.5 Outline of the Study

Chapter 2 contains a discussion of selective and broad-based employment tax credit programs, including the New Jobs Tax Credit passed by Congress in 1977. A summary of the academic literature that pertains to employment tax credits is provided in

chapter 3. Chapter 4 develops several analytical structures for viewing the impact of employment credits on the individual firm. Specifically, the important distinction between hours and employees is developed and analyzed in the context of two microeconomic models of firm behavior. Chapter 4 also provides a more complete discussion of the parameters of the various employment credit programs in the context of the specific models of firm behavior.

The integrated macroeconomic model is presented in chapter 5, as well as numerical calculations for the 1976 United States economy.

NOTES

1. The investment tax credit is generally viewed as a *long*-term program for stimulating real capital expenditure.

2. REVIEW OF EMPLOYMENT TAX CREDIT PROGRAMS

We will use the term "employment tax credit" to refer to subsidy and tax credit programs that seek to stimulate employment by reducing the effective real cost of some component of labor services. In general, tax credits can differ from subsidies, partly because tax rates vary between firms whereas a subsidy usually applies equally to all firms. Further, since tax credits can only be applied against a tax liability, firms that incur losses are often not eligible for credits. It is also possible that employers react differently to subsidies and to tax credits. On a practical level, the administration of a tax credit is usually handled by the Internal Revenue Service, while subsidies are typically administered by some other agency. The adoption of a subsidy program other than a tax credit program raises significant administrative problems of requiring firms to fill out additional information as well as the necessity of developing additional monitoring functions by the administrative agency.

2.1 "Selective" Employment Incentive Programs

Prior to 1976, a modest number of "selective" employment tax credit programs were proposed. These programs were principally categorical in structure and typically involved the establishment of wage rate or hiring cost supplements for older workers, the

handicapped, Aid to Families with Dependent Children (AFDC) participants, veterans, or the poor. Frequently, these selective credits were aimed at potential rather than actual members of the work force. Because the categorical programs induced employers to substitute eligible workers for ineligible workers, it is probable that their impact on overall employment was slight.

A small legislative program resulted. For example, the contract portion of the Job Opportunities in the Business Sector (JOBS) program was designed in the late 1960s to stimulate the private sector employment of unskilled workers and low income members of the work force. The program was conceptually a per-employee subsidy, for it reduced the initial hiring costs of the eligible participants. Also, the Work Incentive (WIN) tax credit passed in 1971 was intended to encourage private sector employment of welfare recipients by providing a tax credit to employers of eligible WIN participants. In 1975, the Tax Reduction Act extended the WIN tax credit to any AFDC recipient. WIN was designed to increase the productivity and private sector employability of welfare recipients by encouraging their training, work experience, and employment opportunities.

Broad-based employment credit programs that seek to encourage employment of involuntarily unemployed members of the work force differ from the categorical programs. Presumably, in many cases where the selective programs are tried, there are structural impediments hindering the employment possibilities of the targeted group. These structural problems are not as prevalent for members of the labor force who are involuntarily unemployed. In other words, the traditional distinction between "structural" and "involuntary" unemployment is a useful notion when evaluating the potential impact of a broad-based employment tax credit proposal. It is not correct, or possible, to prejudge the effects on the economy of the New Jobs Tax Credit based on the rather dismal performance of the WIN program.

2.2 Foreign Employment Credit Programs

The Netherlands, France, the United Kingdom, Japan, Sweden, the Federal Republic of Germany, Ireland, Spain, and Italy have introduced temporary marginal employment credit or wage subsidy programs, although many of these programs are essentially categorical and frequently include various job-training dimensions. These programs are primarily cash subsidies to eligible employers for marginal increases in employment; the Spanish program, however, offers the wage credit as an offset to income tax liability.

The Netherlands adopted a nationwide employment promotion measure in 1974 that provides a short term (26 weeks) subsidy to employers who hire displaced workers. Similarly, the French initiated a Job Creation Bonus program in 1975 which pays a flat subsidy the first six months for each new worker hired and retained for one year. The French program restricts eligibility to the long term unemployed and new labor market entrants; thus, it is similar in effect to the JOBS program in the United States. Britain has adopted various regional employment subsidies that are targeted at manufacturing industries. In Italy, firms are provided a tax credit against payroll tax liability that is short term in nature and clearly seeks to offset temporary increases in real wages that follow a decline in business activity. Sweden recently reduced the payroll tax rate by 50 percent, presumably to stimulate short term employment.

Great Britain, Japan, and Sweden have established programs that seek to encourage firms to retain their existing work forces in the face of declining demand. The Japanese program subsidizes firms who place their workers on temporary layoff; both employers and worker representatives must agree to the layoff. The British Employment Protection Bill of 1965 reimburses employer-paid payments to laid-off workers. In Sweden, firms are paid up to $5.25 per hour toward the wages of workers who would otherwise be laid off. Most of these programs seek to reduce the rate of layoff rather than to increase the new hire rate.

2.3 Broad-Based Employment Credit Programs in the United States

In 1971, several senators, including Senators Javits and Brooke, proposed an economy-wide "tax credit for the creation of additional jobs." The bill called for a tax credit of $4 per man-day (a seven-hour day per employee) for those firms whose total man-days increased over a base which was established at the previous year's level. They argued that all private employers should be eligible and that no limitations should be set on the amount of credit that could be paid to an individual taxpayer. A preliminary analysis completed at that time by the staff of the Joint Economic Committee indicated that a $1.8 billion credit program would produce 500,000 additional jobs by the end of the fourth quarter of program operation. This program implied a very modest cost of $3,600 per job created. The proposal, however, received little support from either the Congress or the Administration.

Several legislative efforts were initiated during the Ninety-fourth Congress (1975-76) to subsidize the employment of the currently unemployed. In addition, Senator Dole proposed legislation that would lift the restriction that workers eligible for the credit must be unemployed. His program triggered a wage credit for the economy when the unemployment rate reached 6 percent; then, for each half of a percent increase in the unemployment rate, the credit increased by 10 percent. Again, little sustained interest emerged.

Although there was only modest legislative attention devoted to economy-wide employment credits prior to 1976, there were no fewer than fifteen pieces of legislation on the subject submitted to the Ninety-fifth Congress (1976-77).[1] The topic was hotly debated in Congressional hearings and the popular press.[2] From this debate there developed a series of specific programs from both the Administration and the Congress.

The Carter Administration suggested a tax credit on all private sector employment. As proposed, that plan would reduce the personal or corporate tax liability of employers by 4 percent of the

employer's Social Security contribution. The credit would be "refundable" to the extent that it exceeded tax liability. (Refundable means that when the credit exceeded the firm's tax liability, the program would permit payments in excess of the tax liability to be made directly by the United States Treasury to the firm.) This provision implied that even firms operating at a loss would remain eligible to receive the credit. Thus, the program was intended to be a direct subsidy to private business. Under the Administration proposal, firms could choose either this employment tax credit or an increase in the investment tax credit rate to 12 percent from the current 10 percent rate.

Legislation from the House in 1977 was initiated by Congressman Ullman (H.R. 3477; see also U.S. Congress, Congressional Budget Office, 1977). In contrast to the Administration's proposal, Ullman's version called for a tax credit based on net increases in employment over the previous year's base. This form of credit has been called a marginal employment tax credit. In this version, the initial employment level was to be based, not on the number of persons employed, but on that part of the total wage bill subject to unemployment insurance tax under the Federal Unemployment Tax Act (FUTA). Employers compute their FUTA wage base by summing the annual salary of each employee earnings less than $4,200 plus the amount of $4,200 for each employee earning more than $4,200. Ullman's plan proposed to use this FUTA wage bill as the initial base and to provide credit to firms whose annual FUTA wage bill exceeded 103 percent of the previous year's FUTA wage bill. The proposed credit was 40 percent of the amount exceeding the 103 percent floor. The 103 percent figure was used to account for normal growth in wages. The credit could not exceed $40,000 per firm and was slated to expire after 1978.

2.4 The New Jobs Tax Credit

The employment tax credit program that eventually became law as part of the Tax Reduction and Simplification Act of 1977 was a modified version of the marginal employment tax credit proposed by Ullman. This legislation stipulates a two-fold eligibility

requirement for firms. The act maintains the House proposal that the initial base of the program depends on the FUTA wage bill. In addition, the act introduces a separate base requirement which depends on the total wage bill. Under this system,eligibility for the credit requires both a 102 percent increase in the firm's FUTA wage bill and a 105 percent increase in the firm's total wage bill. The actual amount of the credit is equal to the smaller of (a) 50 percent of the excess of the current FUTA wage bill over 102 percent of the FUTA wage bill of the previous year or (b) 50 percent of the excess of the current total wage bill over 105 percent of the total wage bill of the previous year. The program stipulates that excess credits can be carried back three years or forward seven years.

The program includes several restrictions which limit the amount of credit received by any one firm. In particular, the credit to a firm is limited to 25 percent of the current FUTA wage bill and cannot exceed $100,000, except when hiring the handicapped. Finally, the legislation clearly defines the short-run nature of this fiscal instrument by extending the program only through the end of 1978.

2.5 A Critical Evaluation of the New Jobs Tax Credit

Several features of the New Jobs Tax Credit deserve comment, including the following: (1) the dual base requirement, (2) the selection of the previous year's wage bill as the bench mark for both bases, (3) the temporary nature of the credit, (4) the $100,000 ceiling on the credit, and (5) the stipulation that employers' deductions for wages must be reduced by the amount of the credit, and (6) the way the credit is proportionally related to the number of employees.

The two-base requirement is designed to overcome several incentive problems which arise from a single-base program. On the one hand, if the credit is received solely on increases in the total wage bill, then the credit would apply to increases in nominal wages as well as to increases in employment—firms would receive credit for increases in labor costs not associated with increases in

employment. The FUTA base partially offsets this problem. On the other hand, if the credit were based solely on increases in the FUTA wage bill, firms would find it worthwhile to substitute part-time for full-time workers. A further advantage of using FUTA and total wage-bill bases is that the program is easily administered. Nearly all private employers maintain records for FUTA returns (Form 940) and total wage costs. Thus, there is no need for the creation of additional information from employers to monitor the NewJobs Tax Credit program.

A possible incentive problem associated with the New Jobs Tax Credit involves the establishment of the credit base. If a firm does not expect to qualify for the credit in the first year, then it may choose to lay off workers to increase the potential credit in the second year. Thus, the structure of the program may lead firms to decrease or, at least, not to expand current employment so that the future employment credit will be higher. This is a potentially destabilizing feature of the program, but in practice this effect is probably slight. Still, there is no easy way to establish a base that does not require the acquisition of additional information from the firm. It does appear, however, that some criterion that uses an average of employment levels over previous years would overcome this difficulty. The question of the optimal base will be considered at some length in chapter 4.

The temporary nature of the credit appears to be a desirable feature. The employment credit should be viewed as a response by the fiscal authority to *current* changes in economic conditions. Its purpose is to assist in the elimination of disequilibrium in the labor market that is caused by unanticipated changes in aggregate demand and/or aggregate supply. Whether or not the credit can or should be eliminated in 1978 depends on conditions prevailing in 1978, conditions which cannot be completely anticipated either by employers or the fiscal authority. Firms are not sure whether the credit will be extended beyond 1978; therefore, they will increase employment and build up inventories in the current period. Furthermore, the temporary nature of the New Jobs Tax Credit will not precipitate as much long term substitution of labor for capital as would occur if the credit were permanent.

The ceiling of $100,000 annually per employer is an undesirable feature of the program. The purpose of the limit presumably is to keep the cost of the program down as well as to reduce the amount of windfall accruing to large, growing firms. While some have argued that the permanent investment tax credit favors the large, capital intensive corporations at the expense of the small, labor intensive ones, a ceiling on the short term employment tax credit is not an effective way to redress these inequities in the permanent tax structure. The obvious disadvantage of a ceiling is that it constrains the employment incentive of large firms. Since large firms employ a significant percentage of the work force, a ceiling on the total credit of $100,000 severely limits the program's effectiveness.

Since a firm's tax deduction for wages must be reduced by the amount of the credit, the credit is progressive in the sense that employers in lower tax brackets receive a higher after-tax credit per employee. Based on current tax rates, corporations with profits exceeding $50,000 receive a net after-tax credit equal to 26 percent of the increase in their FUTA wage bill per eligible worker hired. For firms earning less than $50,000, the net credit is approximately 40 percent of the increase in the FUTA wage bill per eligible worker hired.

The structure of the credit acts to reduce the per-employee cost of labor. We will show in chapter 4 that a per-employee credit implies that the cost of low-wage workers is reduced appreciably more than that of medium- and high-wage workers. For example, under the New Jobs Tax Credit the pre-tax cost of adding an $8,000 employee is reduced by 26 percent per year, while that of a $20,000 employee is reduced by 10.5 percent. Moreover, the wages of part-time employees are greatly reduced relative to full-time workers. This means that the New Jobs Tax Credit should stimulate the employment of part-time and low-skill workers whose ranks include a high proportion of women, minorities, and teenagers.

NOTES

1. This legislation is summarized in a study on employment tax credit programs provided by the Congressional Budget Office (1977).

2. A portion of the Congressional floor debate is contained in Hearings before the Select Committee on Small Business (1977).

3. A detailed description of the program is provided in "Tax Information on Jobs Tax Credit," Publication 902, 1977 Edition, Department of the Treasury, Internal Revenue Service.

3. REVIEW OF THE LITERATURE PERTAINING TO ECONOMY-WIDE EMPLOYMENT TAX CREDIT PROGRAMS

3.1 Selective Employment Credit Programs

While much of the recent attention given to employment tax credit programs focuses on the aggregate employment implications of economy-wide wage-bill subsidies, there is considerable literature on categorical or selective wage credit programs.[1] The purpose of a categorical program is to direct wage subsidies to a particular segment of the labor force. For example, selective credits have been suggested for depressed areas of developed economies, urban areas of developing economies, income support programs for the poor, job training of the unskilled, incentives to hire older workers and the handicapped, and as alternatives to tariff protection. Since our focus is on economy-wide programs, the selective employment credit literature will not be explored here; we do, however, provide short abstracts of some of this literature in the references to this study.

3.2 Broad-Based Employment Credit Programs

The conceptual literature on the aggregate effects of broadly based employment credits is less extensive and less well known. The first economist of distinction to address the issue of a broad-based wage subsidy as a means for dealing with general

unemployment was Pigou. His analysis, developed in 1932 and 1933, examined the potential cost to the government of several different methods of stimulating employment and output, including wage subsidies, public works programs, and various output subsidies. Pigou argued that unless the demand for output were completely unresponsive to changes in the real cost of labor services, a wage rate subsidy to business would stimulate the demand for labor and lead to an increase in real output. Presumably, he felt that product prices were sufficiently flexible to clear the commodity markets in response to the credit-induced increase in output. Pigou also argued that public works programs would generally be more expensive per job created than would wage subsidies, which could in fact yield negative costs to the government.

This line of reasoning was later extended in a 1936 paper by Kaldor, who also argued that a wage subsidy would reduce labor cost, increase business profit, and generally encourage firms to expand employment. Kaldor considered the relative advantages of a wage credit paid on all employment versus a credit on net increases in employment and attempted to provide some indirect empirical evidence regarding the net cost to the government for each of these alternative strategies. Like Pigou before him, he argued that a broad-based wage subsidy was the superior strategy for dealing with general unemployment.

In a 1949 United Nations communique, Frisch examined the aggregate empirical implication of various price-and-wage tax subsidies that were intended to affect the level of employment. A notable feature of Frisch's econometric model was that the labor market was not presumed to be in continual equilibrium; rather, he introduced demand and supply pressures for labor in such a way that these factors influenced the solution. A general wage credit was introduced into the model as a percentage of the total wage bill, where the credit could be positive or negative (a tax), and imposed at a flat, progressive, or regressive rate. Frisch clearly recognized the importance of various parameters, for he argued that a wage credit would be a "much easier . . . political measure to increase the national output when the elasticity of production

and the elasticity of spending are both high than when they are both low" (p. 17). Frisch's comments on the short-run stabilization features of the wage-bill credit are worth repeating. He argued that a wage-bill subsidy offered interesting countercyclical features because it could be used at very short notice. Further, if the credit were maintained under normal conditions, a reduction in the rate "ought to be highly inducive [*sic*] to entrepreneurial expansion, thus making it possible to counteract a slump" (p. 45).

A more recent example of an attempt to estimate empirically the effects of an employment tax credit was that provided by Roberts and Thunen in 1971 supporting the Javits-Brooke employment credit bill. As did Frisch, they employed an aggregate econometric model to simulate the effects of the credit program on the United States economy. Their results indicated that the credit would significantly stimulate employment and production, increase labor income and business profits, and reduce the federal deficit.

A theoretical framework and numerical estimates for an economy-wide wage-bill credit were developed by Fethke and Williamson in 1976. The aggregate model they used contained behavioral and technical equations that represented commodity, money, and labor markets. The analysis traced the effects of changes in the wage credit rate and the program base on employment, output, the wage and price levels, and net government revenue. One significant advantage of this aggregate framework was that it allowed explicit incorporation of the feedback effects on government revenue of the increase in taxes and decrease in transfers generated by the credit program. The analysis also included consideration of several strategies for financing the wage-bill credit. The principal results of the analysis were the following: (1) employment and output expanded in response to an increase in the wage credit rate, and the expansion in employment could occur without necessarily requiring or precipitating an increase in the price level; (2) the base level associated with the credit could be varied to influence aggregate demand and the price level; and (3) for the United States data, numerical calculations showed that a variable base-wage credit

plan would have significant effects on employment, output, and prices at a relatively small net cost to government.

In a separate theoretical study, Fethke and Policano (1977) compared the output stabilization and inflationary consequences of an employment tax credit with those of traditional monetary policy. One result was that both monetary and employment tax credit policies could be used to minimize fluctuations in output. When shocks to the economy developed on the demand side, the monetary policy rule implied smaller fluctuations in the inflation rate than did the corresponding employment credit strategy. On the other hand, when the economy was subjected to supply-side shocks (such as the energy crisis), the employment tax credit implied smaller fluctuations in the rate of inflation than did the corresponding monetary policy. The analysis suggested that the appropriate policy strategy may involve a mixture of employment credit and monetary measures.

The literature which has been discussed focuses on the macroeconomic effects of broad-based employment credit programs. Recently, several attempts have been made to use aggregated microeconomic models as structures for developing the empirical impact of employment credit programs. For example, Kesselman, Williamson, and Berndt (1977) analyzed the relative effectiveness of an investment tax credit versus an employment tax credit. In particular, for the period from 1962 to 1971, they simulated the impact on United States manufacturing output of replacing the investment tax credit with an employment tax credit of an equivalent cost to the government. Their main conclusions were that total employment would have been from .5 to more than 1 percent higher in many of the years and that use of capital services would have been from 1 to 6 percent lower during the period. They also argued that an employment tax credit would have induced firms to substitute blue-collar workers for capital and for white-collar workers. Subsequent empirical work by Berndt (forthcoming), using the same data, demonstrated that the removal of energy price ceilings and investment incentives and the adoption of a 4 percent employment tax credit would have decreased energy use in manufacturing by 5 percent and increased

employment by over 2 percent. One problem with both of these studies is that they examine the effect of a permanent employment tax credit without considering the general equilibrium response of the system. Specifically, by assuming that the elasticity of supply of labor services is infinite, they ignore the question of shifting of the credit through increases in wages. The present analysis examines the general equilibrium effects of the wage credit in a complete macroeconomic framework.

Hamermesh (1977) conducted simulations of the probable effects on the United States economy in 1975 had an employment tax credit been implemented in mid-1974. One of the main results of his analysis was that the implementation of a subsidy limited to net job creation above a base level equal to 100 percent of 1974 employment would have produced relatively few jobs in 1975. Because the economy was in the midst of a severe recession, few firms would have qualified for a credit on net job creation above the 1974 level of employment. As a result, Hamermesh advocated implementing a subsidy at employment of 85 or 90 percent of the base-year employment. In these cases, his simulations indicated that an employment tax credit could create a substantial number of jobs even if aggregate employment were decreasing. Hamermesh also examined the demographic composition of the employment induced by a percentage marginal employment tax credit program. His results suggested that in a recession the program would be biased slightly toward the hiring of prime-age workers and slightly against hiring younger, particularly black, workers.

Hamermesh's results can be compared to those obtained by Johnson and Tomola (1977) with regard to the composition of public service employment under the Public Employment Program (PEP) and the Comprehensive Employment and Training Act (CETA) of 1973. Johnson and Tomola found a significantly larger percentage of youths aged 16-24 and nonwhites employed for PEP and CETA than Hamermesh found for the employment tax credit. These results suggest that the PEP and CETA programs which offer a dollar amount subsidy per worker rather than a percentage subsidy of the total wage bill would be

preferable if the goal is to employ the younger, nonwhite worker. Specifically, a dollar amount subsidy would provide a greater percentage subsidy for hiring low-wage workers.

This analysis has been fairly useful in assessing the effects of employment tax credit programs. However, none of the literature discussed thus far presents a comprehensive analysis of the microeconomic response of individual firms combined with an examination of the complete macroeconomic response of the aggregate system. The following chapters provide this synthesis.

NOTES

1. Reviews of selective credit programs are contained in Kesselman, Williamson, and Berndt (1977), Fethke and Williamson (1976), Hamermesh (1977), and the Congressional Budget Office (1977).

4. THE EFFECTS OF EMPLOYMENT TAX CREDITS ON INDIVIDUAL FIRMS

Since the employment credit affects various components of labor cost, the principal concept required to evaluate a specific program is the form and character of the firm's demand for labor. Our interest, therefore, focuses on the determinants and qualitative properties of this function. The first two sections of the chapter review the results provided by basic economic theory of the demand for labor. This review leads to the development of two microeconomic models of the behavior of the firm. The first model describes the firm as selecting the number of hours and the number of employees so as to maximize profit. The second formulation describes a situation where product demand is specified and the firm acts to minimize the costs associated with a given level of labor services. Both models incorporate demand for labor functions that distinguish between hours per employee per period and the number of employees. The models differ in the assumptions made regarding the firm's and industry's responses to changes in product demand. The first case, which we describe as "competitive," presumes that prices and wages are flexible and that commodity and labor markets adjust quickly and smoothly to market disturbances. The second case, which is termed "Keynesian," asserts that prices and wages display certain rigidities in responding to changes in market conditions. These

two structures suggest alternative specifications and qualitative properties for the firm's demand functions for hours and employees.

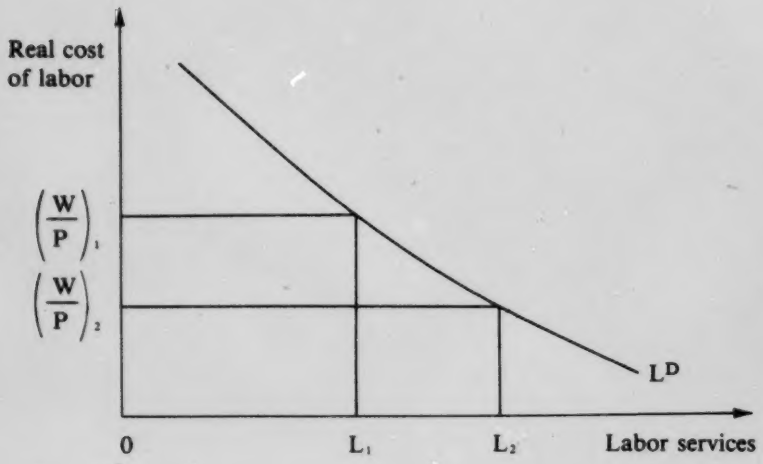
The final section of the chapter consists of an evaluation of specific employment tax credit programs from the perspective of the different models. In general, the impact of a particular employment credit will depend on whether the tax credit is offered per employee or per man-hour, the base of the program, and the model chosen to explain the behavior of the employer.

4.1 The Traditional Model of the Demand for Labor Services

Traditional theory describes the firm as seeking to maximize profit, with the price of output, labor cost, and the interest rate all assumed to be determined by the interaction of competitive market forces. In this framework, the demand for labor services is determined by employers, who compare the cost of labor services with the revenue created by the sale of output produced by these services. The familiar rule for determining the level of employment is to expand the use of labor until the incremental cost of labor equals the incremental revenue generated. Given this basic proposition, an employment tax credit that reduces the cost of labor will induce employers to increase the quantity demanded of labor in an attempt to reestablish the profit-maximizing condition. The analysis can be illustrated with the aid of figure 4.1. The initial average (and marginal) cost per unit of labor is $(W/P)_1$, and the firm's demand curve for labor is represented by L^D. In this representation, W is the nominal wage, and P is the price level. An increase in W or a decrease in P will increase the marginal cost of labor. A decline in the cost of labor from $(W/P)_1$ to $(W/P)_2$ implies that the quantity demanded of labor services must increase from L_1 to L_2 to reestablish the profit-maximizing level.

The technical nature of the production process is an important determinant of the responsiveness of the demand for labor to a credit-induced change in the price of labor. The traditional

Figure 4.1 Traditional Short-Run Demand for Labor



L^D = demand for labor services

$\frac{W}{P}$ = real cost per unit of labor services

framework presumes that inputs can be used by the firm in variable proportions. A reduction in the price of labor will provide an incentive for the employer to increase the use of labor relative to other inputs, and the variable proportion production process will accommodate the change. On the other hand, if input proportions are technically fixed by the short-run production function, the demand for labor will depend only on the level of output and will be independent of input prices. The so-called "putty-clay" synthesis, for example, asserts that *ex ante* production processes have substitutable factors, while *ex post* production processes maintain fixed proportions of labor services to utilized capital. Under a fixed proportions production process, a credit-induced change in cost—even of considerable magnitude—will have no direct effect on labor demand. The credit will simply reduce the cost associated with a given level of output and, thereby, provide a windfall cash flow to the employer. With fixed proportions, the demand for labor will increase when there is an increase in the utilization of capital, and capital utilization depends on the demand for output. It develops, therefore, that the character of the production process is important in assessing the responsiveness of the demand for labor to credit-induced changes in the wage rate.

The elasticity of demand for labor. An important measure of the potential effectiveness of an employment tax credit program is the elasticity of demand for labor (elasticity measures the percentage change in the quantity demanded relative to the percentage change in price). In general, the more responsive is the quantity demanded of labor to changes in cost, the smaller is the size of the credit required to stimulate a given increase in the use of labor. However, if the short term demand for labor is completely unresponsive to changes in cost, then the credit will have no direct effect. The question of the responsiveness of the demand for labor to changes in the wage rate has been the subject of numerous empirical studies. The large body of empirical work on production functions and indirect cost functions focuses on long-run relationships between inputs and output, and, at least for manufacturing industries, the evidence tends to support the idea that factors are to a degree substitutable.

There is considerably less known about the properties of short-run production functions. While the studies in this area use quite different statistical procedures and data sources, there is some agreement concerning the magnitude of the short term elasticity of demand for labor. In general, the empirical work reveals that estimates of the elasticity of demand for labor are of the correct sign (negative) but that they are often small and occasionally statistically insignificant. In a rather complete survey of the econometric studies of labor demand elasticities, Hamermesh (1976) provides a summary of the range estimated for the four-quarter total elasticity of demand for labor in manufacturing (typically measured in man-hours). The low value reported in the literature is -.09, the median value is -.32, and the high value is -.62. In the case of the low value, for example, a 1 percent decrease in the wage will lead to a .09 percent increase in the quantity demanded of labor. In other words, to achieve a 1 percent increase in man-hours, the hourly wage must fall by 11.11 percent. However, if the four-quarter total elasticity of demand is -.62, the high value reported in the literature, a 1.61 percent decrease in the incremental wage will yield a 1 percent increase in man-hours demanded.

Knowledge of the properties of the elasticity of demand for man-hours is useful in considering the effects of alternative forms of the employment tax credit. For example, several programs have advocated a tax credit against the income tax liability of firms whose current wage bill (average wage rate times the quantity of labor services) exceeds some previous year's level. If the average wage rises by 7 percent, for example, and the elasticity of demand for labor is -.32 (a representative estimate from the literature), then the wage bill will increase by 4.76 percent, while the quantity of labor services demanded will *fall* by 2.24 percent. In this case, firms that are actually reducing their use of labor services will receive a credit against income taxes. Presumably, the purpose of the credit is not to reward firms for experiencing inflationary increases in labor costs that are independent of (or not directly related to) increases in employment. One reason for setting the base of the program at a level greater than 100 percent of the

previous period's wage bill is to avoid this subsidization of inflationary wage increases.

Input substitution. The traditional model of input demand recognizes that labor is often a substitute for the services of other productive inputs, particularly capital. Thus, a reduction in the price of labor will lead to substitution of labor for capital in the production process. We recognize the important long-run consequences of permanent changes in input price ratios. The employment tax credit, which is known by firms to represent a short term policy response to disequilibrium in the labor markets, will not initiate as much substitution of labor for capital as would a permanent credit. We basically assume, therefore, that capital resources are fixed in the short run, and that we can direct our attention to the employment credit's immediate impact on the demand for labor services. Indeed, all available evidence indicates that employers can adjust their use of labor services more quickly to changes in costs and expected output levels than they can adjust their use of capital. These results suggest that employment tax credits may be superior to investment incentives for short term stabilization.

There is one form of substitution that will be considered, namely, the substitution possibilities between the number of employees and the number of hours worked per period. In the next section we will discuss these two components of labor services.

4.2 Models with Employees and Hours

One relevant challenge to the simple classical model presented in figure 4.1 concerns the definition of labor services. So far, labor services have been treated as a homogeneous, identifiable flow that is readily observable and measurable. In reality, labor services are rather complicated, heterogeneous combinations of employees, skill levels, and utilization rates. In describing the consequences of an employment credit program that directly affects the relative costs of labor services, it is useful to construct an analytical framework that considers at least some of these dimensions. Thus, a more sophisticated approach to the

development of the demand for labor services is one that recognizes the distinction between the number of employees and the average number of hours worked per employee. In the simplest case, man-hours are the number of employees times the average hours per employee; this measure of labor services is often used in conceptual and empirical studies.

One problem with using man-hours, however, is that the concept implies perfect substitution between hours and employees in the production of labor services, which is not very plausible. Start-up costs, worker fatigue, and other job-related factors affect the degree to which hours can be substituted for employees. To capture these factors, we assume that labor services are, in effect, produced by combining employees with hours. In this framework, output depends on labor services which, in turn, constitute a nonproportional function of the number of employees and the number of hours.[1] Consequently, there are numerous combinations of employees and hours that are capable of producing a specified level of labor services and, thereby, output. Hours and employees, however, are not perfect substitutes.

These ideas can be highlighted using some simple functional representations for man-hours and labor services. Man-hours (M) are defined as the product of hours (h) and employees (N), that is, $M = hN$. Labor services, on the other hand, are a nonproportional function of hours and employees, specificially, $L = F(h,N)$. In general, M is not equal to L for given values of hours and employees. Essentially, the firm "produces" labor services by combining hours per employee with the number of employees. It is these labor services that enter a firm's output production process.

Various cost items, such as hiring and training costs, pension and health plans, unemployment insurance, and severance pay, are mainly employee-specific costs for most firms. Many of these items are uniquely associated with the level, or the rate of change in the level, of employment and have little relationship to costs that are incurred in the direct production of output. Thus, while demand and output might decline during a downturn in business activity, employee-specific costs will typically change more slowly.

Similarly, there are costs associated with the rate of man-hours worked per period. These costs depend directly on the level of production. The result of this simple extension is the recognition that employers possess both a demand function for employees and a demand function for hours. These demand functions depend on similar as well as different cost items.

The questions that occur under this more complete definition of labor services involve the effects of employment tax credit programs on firms' demand for employees versus their demand for hours. Will, for example, the specific form of the employment tax credit induce firms to replace full- with part-time workers? Will firms be encouraged to turn over their labor force just to realize a tax credit on additional (new) employees? Will the credit lead to a reduction in the length of the work week? These are some of the major questions that have been addressed to employment tax programs. The answers depend on the nature of the demand functions for employees and hours as well as on the form taken by the employment credit program.

In an attempt to address some of these questions, we will develop and analyze two simple models of firm behavior that consider both the demand for employees and the demand for hours. The models contain two categories of labor-related costs. The first is the standard wage-bill item which is represented by the average hourly wage times the number of man-hours. The wage bill is closely identified with the direct costs of producing the firm's output. The second cost category consists of employee-specific costs and represents those cost items that a firm must incur each time it hires or retires an employee. As noted, this category includes the costs of private pension and health plans, unemployment compensation, hiring, training, and severance pay. The employee-specific cost function also includes consideration of normal turnover.

A competitive model of a profit-maximizing firm. Assume that a firm maximizes the present value of cash flow, where cash flow is total receipts from sales of the firm's product minus the wage bill and the various costs associated with the number of

employees. Under competitive conditions, the output price, the wage rate, the imputed cost per employee, and the interest rate are assumed to be determined by the interaction of market forces that are external to the firm.[2]

Insight into the nature of the employer's decisions can be gained by examining the two rules for determining the profit-maximizing levels of employment and hours. They are the following:

(i) incremental cost per hour = value of the additional output associated with an additional hour, and

(ii) incremental cost per employee = value of the additional output associated with an additional employee.

The cost of an additional hour is simply the hourly wage times the number of employees. The cost of an additional employee has three components: (1) the hourly wage times the number of hours; (2) the employee-specific cost associated with the level of employment; and (3) the cost of changing the level of employment. These rules for establishing optimal levels of hours and employment represent the extension of the basic proposition of the simple, traditional model of the demand for labor presented in the previous section.

In the context of this model, what are the effects of decreases in the various costs on average hours per employee, employees, and output? The answers to these questions indicate the likely responses of these variables to an employment tax credit program. Analysis of the model yields the qualitative results presented in table 4.1. Each element in the table indicates the effect that a decrease in the cost per employee or wage per man-hour (the columns) has on the number of employees, hours per period, and output (the rows).

A study of this table reveals a number of interesting points. A decrease in the cost per employee will increase the firm's use of employees. Thus, an employment tax credit that provides a direct reduction in employee-specific costs will induce employers to increase the number of employees. This result is an unambiguous and intuitive implication of the analysis. The impact on *hours* of a

Table 4.1 The Effects of a Decrease in Labor Cost Components on the Firm's Choice of Hours, Employees, and Output (Profit Maximization)

	Decrease in cost per employee	Decrease in wage per man-hour
Number of employees	Increase	Increase
Average hours per employee	Decrease (increase)	Increase
Output	Increase	Increase

reduction in the cost per employee is less certain. A reduction in employee cost will provide an incentive for the employer to substitute employees for hours. The resulting increase in the number of employees, however, may affect the productivity of hours. If this cross effect is strong enough, it may offset or nullify the substitution effect. Furthermore, if industry output expands, there may be an added short term inducement for both hours and employees. In any event, the response of hours to a decrease in employee-specific costs is predicted to be direct, that is, a decrease in the cost per employee will decrease the average number of hours per employee.

Next, a decrease in the wage rate per man-hour will generally lead to an increase in both the number of employees and the number of hours. Consequently, an employment tax credit that lowers the wage rate will initiate increases in both components of labor services. The quantitative impact on hours versus employees depends on the properties of the production process. A lower wage may lead to a substantial increase in hours with little employment response, or vice versa. Finally, output will increase with either a decrease in the cost per employee or a decrease in the wage rate.

In summary, effect on hours versus employees in response to a decrease in a specific cost depends on the substitution possibilities between the two inputs, that is, on the own and cross elasticities of demand for hours and employees. Since employment credits affect the cost of labor services, the response of yours and employees will depend on the form taken by the employment tax credit program.

For a competitive *industry,* a reduction of the effective cost of labor services reduces cost for all firms and, thereby, initiates an increase in industry output. The direct impact of the credit is to increase total industry supply and to reduce the market-clearing price level. This familiar process develops from the assumptions that competitive industries are characterized by flexible wages and prices and rapid accommodation to market changes. Even if an industry possesses elements of market imperfections, a decline in the marginal cost of output will usually initiate an increase in output; however, it is more difficult to predict the magnitude of the increase. Thus, if the United States economy can reasonably be characterized as "competitive," an employment tax credit program that lowers the effective cost of labor will also increase total employment of labor and output of goods and services, and decrease the level of prices.

Alternatives to the competitive structure. The competitive model assumes flexible wages and prices and markets that adjust smoothly and quickly to technical or behavioral changes. This view is not universally accepted. In a "Keynesian" framework, a central proposition is that wage and price rigidities prevent commodity and labor markets from adjusting quickly to achieve equilibrium.[3] In fact, transactions for labor and commodities take place when their markets are out of equilibrium. Because prices are assumed to be rigid, firms that face declining demand for their output are constrained in that they cannot sell more than the amount demanded at the prevailing price. In the absence of inventory accumulation, these firms tend to produce only the amounts that can be sold at given prices. Consequently, in a "Keynesian" framework, the essential determinant of employment (unemployment) is the level of real aggregate demand. A reduction in the real cost of labor during a business recession will,

under this structure, have no direct effect on the quantity demanded of labor services or the level of real output.

It is apparently the "Keynesian" viewpoint that leads some critics of employment tax credit programs to argue that such credits will simply provide windfall gains to business firms and provide no direct stimulus to real output and employment. Even in this situation, however, firms will seek to produce the constrained output rate at minimum cost. Thus, employment tax credits will at least affect the decisions of firms regarding the hours per employee versus the stock of employees.

The presence (or absence) of output in the demand functions for hours and employees depends on the underlying structural assumptions regarding the flexibility of real wages. For the Keynesian structure, the presumed rigidity of real wages in the face of declining demand leads to the conclusion that output is demand determined. Thus, the firm will view the short term rate of output as exogenous. With rigidity in the price and wage levels, the firm can best be described as choosing the combination of hours per employee and number of employees that minimizes the cost of producing the demand-determined level of output. To capture these circumstances, we develop a model which describes employers as minimizing the cost associated with a given level of labor services.[4] As before, total costs consist of employee-specific costs plus costs associated with the number of man-hours. Output is a function of labor services, which depends on hours and employees. Since a given level of labor services (and output) can be produced by various combinations of hours and employees, initiation of an employment tax credit will encourage substitution between hours and employees; it will not directly stimulate output under the Keynesian regime as it did in the profit-maximization model. The nature of the substitution between hours and employees will depend on the structure of the employment credit. The eventual effect on prices and output depends on the price determination process and the clearing mechanisms in commodity and labor markets.

The properties of the model developed to describe this situation are summarized in table 4.2. Each entry indicates the qualitative response of the number of employees or hours (horizontal variables) to a decrease in the cost per employee, the wage per man-hour, or output (the vertical entries). As expected, a decrease in the cost per employee will increase the number of employees and decrease the average hours per employee. This result holds for all plausible production processes. The obvious explanation for these qualitative responses is the fact that output is exogenous. When the firm faces a short term output constraint, a decrease in the cost per employee will encourage firms to increase employees and decrease the average number of hours per employee.

Next, a reduction in the wage will increase average hours per employee and reduce employment. Thus, in the context of a cost-minimization framework, an employment tax credit that reduces the hourly wage will provide the firm with an inducement to substitute hours for employees in the production of labor services. The program, in this case, may not lead to the desired result of increasing total labor services.

When output increases, the analysis indicates that hours and employees will both typically increase. As previously discussed with respect to the employee-hour trade-offs under the traditional profit-maximization model, it is possible to identify production processes for which these results will not hold. For the production processes that we consider, however, the results presented in table 4.2 follow.

In summary, the qualitative results of the cost-minimization model are different from those of the profit-maximization models presented in the previous section. The difference largely stems from the assumption that output is constrained. Because there is no output effect, the cost-minimization framework implies that the only impact of a specific employment tax credit is on the employee-hour trade-off.

An interesting variant of this cost-minimization model is one that presumes the average number of hours worked per employee to be fixed, either technically or by convention. In this case, the

Table 4.2 The Effects of a Decrease in Labor Cost Components and Output on the Firm's Choice of Hours and Employees (Cost Minimization)

	Decrease in cost per employee	Decrease in wage per man-hour	Decrease in output
Number of employees	Increase	Decrease	Decrease
Average hours per employee	Decrease	Increase	Decrease

employer can only adjust the number of employees in response to a change in output. The change in employment, however, may still lag behind the change in output. In particular, firms may "hoard" employees during periods of declining business activity, that is, carry employees on their payrolls who are making no current contribution to output. Presumably, firms will do so because it is too expensive to discharge employees during temporary downturns only to incur the employee-specific costs when business conditions improve. These costs are mitigated somewhat if the probability that a laid-off employee will return to the same employer is high; however, available evidence seems to indicate that a significant percentage of laid-off workers actively search the labor market for new employment possibilities (see Bradshaw and Scholl, 1976).

An employment tax credit that reduces the wage cost of existing employees will prolong the maximum time that an employer will hold nonproductive labor. For example, if the employee-specific hiring and layoff costs are $2,000 per employee and the annual wage rate is $12,000, then it pays the employer to maintain an employee on the payroll for up to two months, even if that employee's net contribution to output is zero for that period. If the employment credit reduces the effective wage cost to $8,000,

for example, then the optimal maintenance period will increase to three months. The employment credit programs in Great Britain, Sweden, and Japan, which subsidize employers to temporarily lay off workers with pay rather than to discharge them, seem to be of this nature.

The next section examines the structural consequences of various forms of employment tax credits from the perspective of the models of the demand for labor. As indicated, the response of the firm to an employment incentive depends on the structure of the industry, the nature of the production process for labor services, and the form taken by the credit.

4.3 Alternative Structures for an Employment Tax Credit Program

The short term employment credit program is intended to stimulate the employment of workers who would not be hired if the credit were not available. It is also suggested as a measure for preventing employers from laying off or firing employees as business conditions decline. The program is not usually offered as a device for subsidizing employed workers (the initial program offered by the Carter Administration, however, did seek to reduce the average wage by providing a credit against payroll tax liability). Furthermore, the credit is usually conceived of as a program that does not reward firms for normal employment growth, nor does the program seek to provide credit for workers hired away from other employers.

As discussed in chapter 2, employment tax credits and wage subsidy plans have been suggested and implemented in a variety of forms. In general, these different plans can be described by examining three structural features of each program: (1) the particular *dimension* of labor services that is targeted by the credit; (2) the *base* for determining eligibility; and (3) the magnitude of the credit rate. It is useful to analyze the most prominent forms of employment credit programs in the light of these characteristics.

The targeted dimension of labor services. Many employment credit programs specify a tax credit for each worker employed beyond some prescribed base level of employment. Generally, a per-worker credit lowers the employee-specific costs and, thereby, provides an incentive for employers to substitute employees for hours. This form of substitution, while present in both models of the firm previously discussed, is most significant in the cost-minimization framework where output is given. A per-worker credit can have other consequences as well. For example, unless the base of the program places restrictions on the rate of turnover, a per-employee credit will induce the firm to lay off existing workers and hire new workers in order to become eligible for the credit. Furthermore, the credit as a percentage of the annual wage rate per worker is higher for lower paid workers when the credit is offered as a fixed dollar amount per worker. Consequently, the per-worker credit introduces an incentive to make substitutions between skill classes. Since some individuals advocate special treatment for unskilled labor, a per-worker credit is often suggested as a mechanism for stimulating the employment of young people, women, and minority workers, who comprise a major portion of the part-time, high-turnover, and unskilled work force. In this respect, the proposals to reduce the Social Security contributions of employers for younger members of the work force are equivalent to a per-worker credit. Specifically, elimination of the employer's contribution to Social Security represents a larger percentage reduction in the wage cost of unskilled relative to skilled labor. The end effect on the various skill classes of a per-worker credit will depend on the own and cross elasticities of demand between the classes.

There is some recent evidence pertaining to the likely effects of a per-worker credit on different skill classes of labor and on capital. Kesselman, Williamson, and Berndt (1977) estimate the own-price elasticities and the partial elasticities of substitution for white- and blue-collar workers and for capital. They find that capital and white-collar workers are complements, while blue-collar workers and capital are substitutes. The two categories of labor are mildly substitutable. The 1971 estimates for the own-price elasticities of

demand are -.338 for blue-collar employees, -.192 for white-collar, and -.533 for capital. The partial elasticity of substitution between blue- and white-collar employees is .485; between blue-collar employees and capital, it is 1.277; and between white-collar employees and capital, it is -.477. These results imply that an employment incentive that lowers the price of blue-collar labor relative to white-collar labor and capital will increase the demand for blue-collar employees.

The New Jobs Tax Credit, which is based on increases in the FUTA wage base, has some elements in common with a per-employee credit. Specifically, a firm will receive more credit for several low-wage employees, who add more to the FUTA base, than for one highly paid employee. Also, several part-time employees will receive greater credit than one full-time employee. As previously mentioned, these incentives are only partially eliminated by using an administrative rule that bases the credit on the minimum of the FUTA and the total wage base.

One alternative to the per-worker credit is a credit per man-hour (or a credit per man-day). In the context of the previous models of firm behavior, a credit applied to the number of man-hours will provide employers with an incentive to increase the hours component of labor services relative to the employee component. This tendency will be heightened if there are significant costs associated with changing the level of employment and/or the credit is thought to be temporary. If output is constrained, a credit per man-hour may actually lead to a reduction in the number of employees as the firm changes the hour/employee composition of labor services to minimize cost. In this respect, a man-hour credit has an impact opposite from that of a per-employee credit; that is, there is no incentive to substitute part-time for full-time workers. Like the per-employee credit, however, the man-hour credit favors the use of unskilled relative to skilled man-hours. For example, it may require two man-hours of unskilled labor to produce the same output as one man-hour of skilled labor; however, the credit will be greater if the firm uses the two man-hours of unskilled labor.

An administrative disadvantage of basing the credit on man-hours is the fact that this information is not presently available from standard tax reports filed periodically with the federal government. Establishing a man-hour criterion in industries which have a high percentage of salaried, white-collar employees would be extremely costly and difficult to monitor.

A number of programs apply the credits to the firm's reported payroll. Conceptually, "payroll" includes both employee-specific costs that are not directly related to production and wage-bill costs (the wage rate times man-hours) that depend directly on the level of production. If this is the case, a payroll credit represents a direct credit against the cost of labor services, where labor services are defined as a nonproportional function of hours and employees. If payroll is defined more narrowly as wage costs exclusive of employee-specific costs, then the payroll credit will be equivalent to the credit per man-hour as previously discussed; that is, it will provide employers an incentive to increase the hours component of labor services relative to the employment component.

In the context of the microeconomic models of the demand for labor, the effect of a reduction in the cost of labor services will depend on the structure of the economy. Under the competitive structure, a reduction in the cost of labor leads to an increase in the quantity demanded of labor and a resulting increase in output. Under a Keynesian structure, where firms face a short-run demand constraint, a payroll credit (narrowly defined) will have no direct effect on the use of labor services. The latter proposition is modified considerably if prices are flexible while nominal wage rates are rigid. Then, an increase in the employment tax credit rate will reduce the real cost of labor and stimulate the quantity demanded of labor. These topics will be developed at length in the next chapter, which is concerned with the operation of the aggregate system.

In practice, "payroll" is usually defined to exclude employee-specific costs and, thus, a payroll credit approximates a credit against the wage bill (average wage rate times man-hours per

period). A wage-bill credit is essentially neutral with respect to skill categories since the labor expenses of all skill categories receive the same percentage subsidy. In addition, since wage-bill data are readily available, the program can be administered and monitored using data reported on unemployment or social insurance reports. The main disadvantage of the wage-bill credit is that the wage bill can increase without a corresponding increase in employment. Thus, if the credit is based on a percentage of the wage bill, employers may substitute hours for employees to increase the wage bill and thereby qualify for the credit. This type of credit can also soften employer resistance to increases in union-negotiated wage rates since a portion of the increase can be recovered by the tax credit.

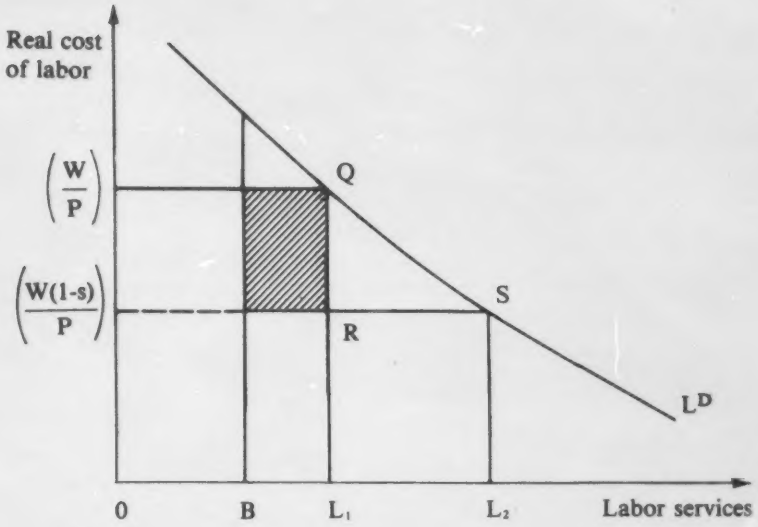
There are currently a number of payroll-related taxes, including social and unemployment insurance, that possess some of the analytical attributes of wage-bill employment credits (see Brechling [1977] for the formulation of the taxable payroll for unemployment insurance). Since the taxable wage base of Social Security is $17,700, which is above the earnings of 80 percent of the work force, an employment credit levied on the Social Security base will have attributes similar to those of an ordinary payroll credit. Indeed, the Carter Administration's proposal to reduce employer contributions to social insurance is an implicit attempt to stimulate employment by decreasing the payroll tax rate. Numerous other countries are also beginning to examine the supply-management possibilities of adjustments in payroll tax rates. At the same time, there is much confusion concerning the nature of the effects of these payroll tax schemes on employment. For example, it is not uncommon to find congressmen who simultaneously support both short term employment tax credits to combat recession and increases in payroll tax rates to maintain the solvency of the social insurance program.

The base of employment tax credit programs. An important result of the traditional model of the demand for labor is that employment decisions by firms depend on the incremental cost of labor. This result means that a reduction in the cost of additional (marginal) labor services will have the same direct impact as will a

general reduction in the average wage rate. This can be demonstrated with the aid of figure 4.2. The base of the credit program is denoted as B; that is, the firm must expand employment beyond B units of labor services before it becomes eligible to receive a credit. The credit reduces the effective real wage for all labor services employed beyond the base. If the base is established at some level below current employment, which is the case in figure 4.2, a windfall occurs. The windfall develops on all employment between the base, B, and what the firm would have employed in the absence of the credit (the shaded area in figure 4.2). Thus, the firm will receive some credit even if there is no additional employment. In figure 4.2, the initial wage rate and employment are (W/P) and L_1, respectively. The credit reduces the effective wage to (W(1-s)/P) for all labor services employed beyond the base, B. To reestablish profit maximization, the employer will expand its use of labor services to L_2, and the firm receives a windfall gain on L_1-B>0 units of labor services. If the base is established at an even lower level than B, the size of the windfall increases. In general, the triangular area QRS represents the increase in gross profit (beyond any windfall) associated with the employment credit program whose base is B.

Because of the windfall, many adherents of employment tax credit programs argue that the credit should be offered only for net increases in employment beyond the current level. In terms of figure 4.2, this means that the base for eligibility should be established to coincide with current employment, L_1. By eliminating the windfall, advocates argue that a *marginal* employment tax credit offers employers the same inducement to expand employment as would an employment tax credit that reduces the average wage rate for all workers, but at a lower direct dollar outlay by the government. A marginal employment credit closely parallels the investment tax credit since both programs seek to subsidize new purchases of a specific input. Apparent differences between the marginal employment tax credit and the investment tax credit arise because all units of labor services are rehired each period, whereas only part of the firm's stock of capital is newly purchased. This difference is less important when

Figure 4.2 The Base of the Employment Tax Credit in the Traditional Model



L^D = demand for labor services
B = base of the employment tax credit
$\frac{W}{P}$ = real cost per unit of labor services up to the base B
$\frac{W(1-s)}{P}$ = real cost per unit of labor services beyond the base B

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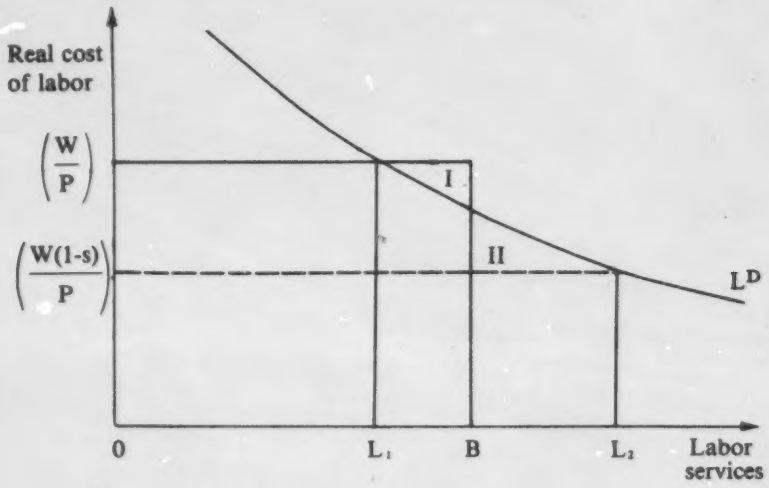
one explicitly recognizes that labor services possess an element of fixity similar to that typically associated with capital. In general, it appears to be a simpler matter to measure the components of labor services—hours worked, employees, etc.—than it is to measure net investment, especially when it is necessary to distinguish between equipment and structures in defining eligible net investment for the investment tax credit.

As we have seen, it is not necessary to credit the wages of all employees in order to increase employment to L_2. For all bases from zero to L_1, the credit will be accepted and employment will rise to L_2. This follows because for employment rates from zero to B the firm pays (W/P), which is below the value of labor's marginal product. Once B is reached, the effective cost of labor drops to (W(1-s)/P), and employment will continue to be profitable until L_2 is reached. If the base exceeds L_1, however, the credit may or may not be accepted. As seen in figure 4.3, for B greater than L_1, the wage cost of B-L_1 units will exceed the value of these units' contribution to output, by area I. Employment must expand to B at the wage (W/P) before the firm is eligible for the credit. The question then becomes whether or not this loss is offset by the gain attributable to the increased employment of credit-subsidized employment. The maximum base for which a firm will accept the credit, and still employ L_2, is where the profit lost by paying B-L_1 labor a wage that exceeds the value of added product is just offset by the gain in profit attributable to employment L_2-B. If area I equals area II, then B is that base. For any base greater than B, the firm will reject the credit program.

In summary, for a given demand for labor, reductions in the base of the employment credit will not effect a firm's employment decision. Base level reductions will affect cash flow, and a low base program provides a firm greater cash flow than a high base program. Thus, base reductions have an impact on the firm that is similar to a change in business income taxes. On the other hand, if the base is set too high, it may be less expensive for the firm to refuse the credit altogether. Even at a high base level, however, it is possible to induce firms to increase employment if the credit

Figure 4.3 Effects on the Demand for Labor When the Base Exceeds Current Employment



L^D = demand for labor services

B = base of the employment tax credit

$\frac{W}{P}$ = real cost per unit of labor services up to the base B

$\frac{W(1-s)}{P}$ = real cost per unit of labor services beyond the base B

program provides a sufficient subsidy for the added (maintained) workers. Such subsidies characterize the British, Swedish, and Japanese programs.

The distinction between a credit on all employment and a credit on net increases in employment can be seen in the recent employment tax credit proposals in the United States. The Administration's employment credit proposal provided a general subsidy to *all* private sector employment; it offered a credit against income tax liability of 4 percent of the employer's Social Security contribution (with a maximum of about $40 per employee, per year). This plan would have reduced tax revenue by approximately $2.4 billion annually but would have reduced the average wage cost by less than one quarter of a percent. In contrast, the New Jobs Tax Credit provides employers with a credit against income tax liability of 50 percent of the first $4,200 of wages paid (per employee) to additional employees in 1977 and 1978. Even though the credit reduces the employer's allowable deduction for wages, the minimum net credit for corporations (assuming the maximum corporate tax rate) for an extra employee earning at least $4,200 is $1,092. Thus, the New Jobs Tax Credit has a much larger marginal incentive effect than the Administration's proposal.

While marginal employment tax credits have received the most legislative attention, probably because they avoid most of the windfall effect, they do not appear to be a flexible countercyclical instrument. The problem involves the practical issue of establishing the base. If the base is set at current employment levels and there is a decline in the demand for labor, firms may choose not to accept the credit because the base is too high. Even worse, employers may lay off workers in the current period to reduce the effective base for the next period. If this occurs, the program may actually destabilize rather than help to stabilize employment.

Thus, the New Jobs Tax Credit with annual updating of the base may have a tendency to destabilize the economy. During the recovery phase of business activity, firms will take advantage of

the credit and begin substituting labor services for other inputs. If demand should slacken in one year, however, firms will lose their eligibility in the next year and begin to cut back on employment. This cutback will develop just when employment stabilization is required. Other firms may choose not to increase employment during the current period but to wait and retain their eligibility for the credit until the next period. Under these circumstances, if most firms in the economy move into and out of the employment credit at the same time, the program will actually act as a built-in destabilizer. Also, if firms in different locations do not grow and decline at the same time, the credit program may cause geographical distortions. Indeed, some critics of the marginal credit argue that improper establishment of the base will lead to the subsidization of growing industries and regions of the economy (such as in the Southeast and West) at the expense of declining industries and regions (as in the Northeast).

The destabilizing factor in the New Jobs Tax Credit is the establishment of the base as some percentage of the firm's last period wage bill. One alternative is to adjust the base according to some aggregate measure of labor market behavior, that is, to develop a *variable-base wage credit*. This concept has appeared in the legislative proposals of Senators Dole and Bentsen and seemingly avoids much of the windfall problem associated with an employment tax credit. The essential idea of a variable-base program is to lower the base in response to a reduction in aggregate employment and to raise the base, possibly in excess of current employment levels, when there is an increase in aggregate employment. During a downturn in business activity, a reduction in the base provides an incentive for employers not to increase their layoff rate. During a sharp upturn, increases in the base will offset the incentive to increase employment simply to earn the credit. Thus, the variable-base wage credit acts to stabilize rather than to destabilize employment. Adjustment of the base, in this fashion, will encourage firms to maintain employees who might otherwise be fired or laid off during periods of declining business activity and prevent employers from receiving a credit on workers who are hired anyway as business conditions improve.

As many have recognized, a variable-base wage credit requires considerably better administration of the program than can probably be expected from the fiscal authority. Specifically, the fiscal authority must identify the current state of the economy and then adjust the base accordingly. Timing and recognition lags would hamper this process as would the deliberative nature of the Congress. In principle, however, base-level adjustment should be no more difficult than adjustment of the money supply by the monetary authority. A second problem with the variable-base concept is that it introduces another complexity into the tax system for employers. Can employers reasonably be expected to monitor changes in the base and then adjust employment accordingly? There is simply no available empirical evidence on this matter; however, base-level adjustments appear no more difficult to recognize and respond to than various other short term adjustments that are made (indirectly) to the cost of capital by the monetary authority.

The magnitude of the employment tax credit rate. The final parameter of the credit program is the magnitude of the credit rate. In general, the credit rate can be represented as a percentage of the hourly wage, the employee-specific costs, or possibly the annual compensation per employee. As previously discussed, the size of the credit increase, combined with the own and cross elasticities of demand for labor, will determine the responsiveness of the usage of labor services to the employment credit program. In the next chapter, we provide numerical estimates of the impact on the United States economy in 1976 of a payroll credit, implemented under various bases. These estimates, which include the full response of the aggregate economy to the credit, indicate that a 1 percent wage credit will initiate about a .08 percent increase in employment.

NOTES

1. Models that distinguish hours and employees in the production of labor services include the efforts of Feldstein (1967), Rosen (1968), Ehrenberg (1971), and Brechling (1975). Empirical work on this topic is available in Craine (1973) and Nadiri and Rosen (1973).

2. The discussion in the text results from an analysis of the following model. The discounted present value of cash flow is represented as

$\Pi = \int_0^\infty [PQ - WhN - ZN - C(\dot{N})] \exp(-it)dt$, with the variables defined as follows:

- Π = present value of cash flow,
- P = the exogenous price of output,
- Q = output,
- W = the per-hour nominal wage rate,
- Z = per-employee cost,
- h = average hours per employee,
- N = number of employees,
- C = cost of changing the number of employees,
- $\dot{N} = \frac{dN}{dt}$ = net change in employment,
- i = the interest rate, and
- t = a time index.

The production function is defined as

$$Q = f(h, N),$$

where $f_h > 0$, $f_N > 0$, $f_{NN} < 0$, and $f_{hh} < 0$ are the usual assumed conditions on the marginal products of average hours and employment. For simplicity, the cost of changing employment is assumed to be linear, that is,

$$C(\dot{N}) = b\dot{N},$$

where b represents the constant cost associated with changing the level of employment from one period to the next.

Necessary conditions for attainment of maximum cash flow are

(i) $f_h = wN$ with $w = W/P$ and

(ii) $f_N = wh + z$ with $z = (\bar{Z} + bi)/P$.

Total differentiation of these conditions yields the qualitative responses of average hours per employee and the number of employees to changes in the real hourly wage (w) and the imputed real cost per employee (z):

$$\frac{dh}{dw} = \frac{Nf_{NN} - h(f_{hN} - f_h/N)}{D'}, \quad \frac{dh}{dz} = \frac{(f_{hN} - f_h/N)}{D'},$$

$$\frac{dN}{dw} = \frac{hf_{hh} - N(f_{hN} - f_h/N)}{D'} \text{ and } \frac{dN}{dz} = \frac{f_{hh}}{D'} \text{ where}$$

$D' = f_{hh}f_{NN} - (f_{hN} - f_h/N)^2 > 0$. The positive sign of the denominator, D', follows directly from the requirement that $d^2\pi < 0$ for a local maximum. The only unambiguous qualitative response is that of employment to changes in the imputed cost of employees. A decrease in the employee-specific cost will increase employment. If $f_{hN} - f_h/N \geq 0$, the other qualitative responses are also unambiguous. While this condition does hold for several well-known production functions, there is no particular reason why $f_{hN} - f_h/N$ should be nonnegative. We argue in the text, however, that the response of average hours to a decrease in the per-employee cost is positive, that is $\frac{dh}{dz} > 0$. Consequently, it follows that $\frac{dh}{dw} < 0$ and $\frac{dN}{dw} < 0$. The response of output, Q, to changes in either w or z is likewise presumed to be inverse, that is, $\frac{dQ}{dw} < 0$ and $\frac{dQ}{dz} < 0$. These signs on the derivatives automatically follow from the condition that $f_{hN} - f_h/N \geq 0$.

3. A recent statement of a complete disequilibrium Keynesian model is provided by Barro and Grossman (1976).

4. The discussion in the text is based on analysis of the following model: A firm that acts to minimize the cost of producing a given output rate can be described as seeking to minimize

$$C = \int_0^\infty [WhN + ZN + C(\dot{N})] \exp(-it)dt,$$

where the variables are defined in footnote 2. The level of output is constrained as $Q^* = f(h, N)$.

Necessary conditions for cost minimization are

(i) $f_h = wN$ with $w = W/\lambda$

(ii) $f_N = wh + z$ with $z = (Z + bi)/\lambda$, where λ is the imputed marginal cost of output. Total differentiation of these necessary conditions yields

$$\frac{dh}{dw} = \frac{-zf_N N}{D} < 0, \frac{dN}{dw} = \frac{zf_h N}{D} > 0 \text{ with } dz = dQ^* = 0,$$

$$\frac{dh}{dz} = \frac{-f_h f_N}{D} > 0, \frac{dN}{dz} = \frac{-f^2 h}{D} < 0 \text{ with } dw = dQ^* = 0,$$

$$\frac{dh}{dQ^*} = \frac{f_N(f_{hN} - f_h/N) - f_h f_{NN}}{D} > 0,$$

$$\frac{dN}{dQ^*} = \frac{f_h(f_{hN} - f_h/N) - f_{hh} f_N}{D} > 0 \text{ with } dw = dz = 0.$$

$D = -[f_{hh}f^2_N + f_{NN}f^2 h - 2f_h f_N - f_h/N)] > 0$. The positive sign for D follows from the assumption that production isoquants are convex to the origin. We again assume that $(f_{hN} - f_h/N) \geq 0$, which determines the signs of $\frac{dh}{dQ^*}$ and $\frac{dN}{dQ^*}$.

5. THE MACROECONOMIC FRAMEWORK

The preceding chapter examined the effects of changes in the credit rate and base on the behavior of the firm. The principle result is that an increase in the credit rate can, under particular market conditions, induce firms to maintain or increase employment and output. Although important, that analysis, as well as that of much of the existing literature in this area, represents only a partial investigation of the employment tax credit program. In particular, much of the existing work ignores the impact of government financing and the feedback effects on the government budget of increased tax revenue and decreased transfers that are generated by the credit program. To complete the analysis, it is necessary to formulate a rigorous model of macroeconomic behavior and to examine the effects of credit policy on price and wage levels and on employment.

The purposes of this chapter are to provide a detailed discussion of a macroeconomic framework and then to utilize this framework to assess the effects of the employment tax credit program. The initial step in developing a macroeconomic framework consists of a microeconomic characterization of the behavior of individual agents in the economy. The behavior of three types of agents—households, firms, and the government—will be examined. We will then analyze the macroeconomic interaction of these

agents in three distinct markets: the commodities market, the labor market, and the money market. Finally, the structure of the model will provide a framework for the calculation of numerical estimates of the impact of an employment tax credit program on the United States economy.

5.1. Microfoundations

Household behavior. We assume that the primary behavioral choices of the household sector involve the sale of labor services and the allocation of income between consumption expenditure and saving. The quantity of labor services which the household is willing to supply increases with increases in the real wage rate, W/P (nominal or money wages/price level). Thus, a decrease in the price level for a fixed nominal wage or an increase in the nominal wage rate for a given price level implies an increase in the quantity of labor services supplied by households. We assume that households allocate a fixed fraction of after-tax income to present consumption expenditure. Wage payments are the main source of household income. In addition, households receive dividends (after-tax distributions of corporate profits) and transfers (unemployment compensation, social security benefits, etc.). Wages and dividends are subject to personal income taxes, while most transfers are nontaxable. Consequently, an increase in wage payments, dividends, or transfers implies an increase in consumption expenditure by a fraction of the increase in income.

The presence of corporate profits as a component of income is significant for the analysis of the effects of the credit rate on consumption expenditure. An increase in the credit rate or a decrease in the credit base lowers the real cost of labor services for the firm and thus increases corporate profits. This increase in profits is received by the household sector in the form of dividends. Consequently, changes in both the credit rate and base affect consumption expenditure.

The fraction of disposable income not consumed is saved by the household either through holdings of money (cash and demand deposits) or through purchases of earning assets (such as stocks,

bonds, and property). The decision to hold money or earning assets depends on the interest rate. The higher the interest rate, the more profitable is the holding of earning assets and the smaller will be the quantity of money held.

The behavior of the firm. As argued in chapter 4, the primary objective of the firm is to choose its input levels in such a way so as to maximize profit. Given the production function, the profit-maximizing input levels determine the firm's level of output. This framework implies that the firm's demand for labor services depends inversely on the real cost of those services. The real cost of labor services is measured by the wage rate (less the employment tax credit rate) divided by the price of the firm's product. An increase in either the price level or the employment tax credit rate or a decrease in the nominal wage rate implies a decrease in the real cost of labor services. In this chapter we plot the demand for labor against the real wage, W/P. Consequently, a decrease in the nominal wage, W, or an increase in the price level, P, results in an increase in the quantity of the demand for labor—that is, a movement along the demand schedule. An increase in the credit rate implies a rightward shift in the demand schedule. The size of the response to a change in the real cost of labor depends on the elasticity of demand for labor. The resulting increase in the firm's utilization of labor implies a corresponding increase in output. Consequently, both the demand for labor and the supply of output depend indirectly on the real cost of labor services.

The firm's profits, net of corporate taxes, are distributed to the household sector in the form of dividends as discussed. An increase in the credit rate or a decrease in the credit base essentially decreases the firm's tax liability and thus increases after-tax profits.

Finally, we assume that capital purchases (a new plant and/or equipment) require the issuance of earnings assets. The firm finances each investment purchase through a sale of earning assets and offers to pay the buyer the market interest rate for the use of these funds. The higher the market rate of interest, the more costly

the firm's issuance of earning assets. Consequently, the firm's demand for investment goods depends inversely on the interest rate.

Government behavior. Our discussion of government behavior focuses on the behavior of the Treasury and the financing strategy selected for the employment tax credit program. In general, government expenditure is financed through net tax revenue (total tax collections less transfer payments) or through issuances of debt (deficit spending). The following analysis considers three alternatives for financing the credit program; we analyze the effects of accommodating changes in the credit program by changes in deficit spending with the level of government expenditure and the tax rate held constant; changes in government expenditure with the size of the deficit and the tax rate unchanged; and changes in the tax rate with the level of government expenditure and the size of the deficit unchanged. Certainly, these three financing strategies do not exhaust the possibilities. In particular, the credit can be financed through various combinations of these alternatives. However, the analysis of the three alternatives summarizes the major effects of credit policy and also can be used to delineate the results of mixed financing schemes.

5.2 The Market Adjustment Processes

The behavior of individual agents in the economy will not be integrated into an analysis of aggregate market behavior. We will examine the market adjustment processes of interest rates in the money market, prices in the commodities market, and most important, the adjustment of nominal wage rates in the labor market.

The money market. The equality of the demand for money and the supply of money determines the interest rate. As previously discussed, household demand for money depends positively on income and negatively on the interest rate. The supply of money, which is controlled by the Federal Reserve System, is assumed to be fixed throughout most of the analysis. An excess supply of money exerts downward pressure on the interest rate. As the

interest rate falls, individuals increase their money holdings, thereby absorbing the excess money in the system. Analogously, excess demand in the money market exerts upward pressure on the interest rate.

The commodities market. The price level in the economy adjusts to discrepancies between aggregate demand and aggregate supply of commodities. Aggregate demand consists of household demand for consumable goods and services, firm demand for investment goods, and government demand for goods and services. As previously discussed, consumption demand increases with increases in disposable income, and investment demand increases with decreases in the interest rate. Aggregate supply of commodities by firms depends inversely on the real cost of labor services. Thus, the quantity of aggregate supply increases with increases in the price level and decreases in the nominal wage rate. In addition, the aggregate supply schedule shifts to the right with increases in the credit rate. Excess demand in the commodities market exerts upward pressure on the price level. The increase in the price level decreases the real wage and stimulates aggregate supply. Furthermore, price increases work through the money market to dampen aggregate demand by causing interest rates to rise. Given a constant nominal supply of money, an increase in the price level decreases the real supply of money. The resultant excess demand for money causes the interest rate to rise, which implies a decrease in the quantity of investment demand in the commodities market.

The labor market. The labor market adjustment process is the most critical for the ensuing analysis of employment tax credits. Recall that the quantity of labor services supplied by households increases with increases in the real wage, and that the quantity of labor services demanded by firms decreases with an increase in the real wage. Figure 5.1 plots these two relationships. The intersection of the demand and supply schedules determines the market-clearing values for actual employment (man-hours) and the real wage. For a given price level, the labor market determines the nominal wage rate. Excess demand for labor services exerts upward pressure on the nominal wage rate. The resulting increase

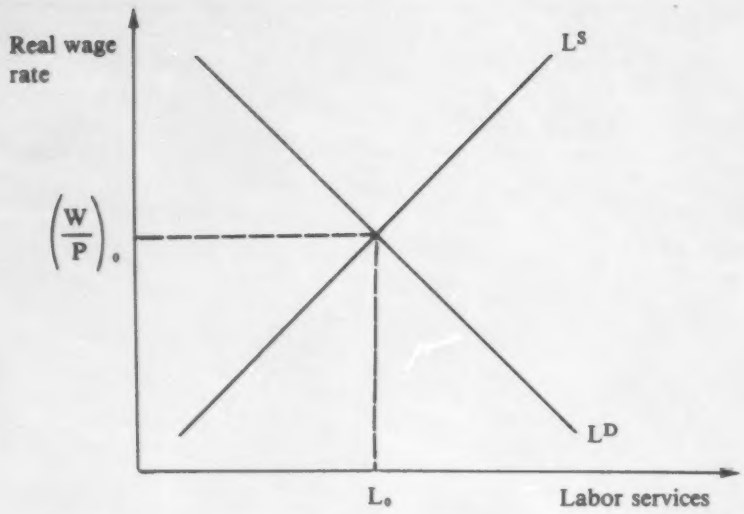
in the nominal wage implies an increase in the real wage and a subsequent increase in the quantity of labor supplied and decrease in the quantity of labor demanded.

The speed of adjustment of the real wage is a critical determinant of labor market behavior. If real wages adjust quickly to accommodate disturbances in labor demand or supply, the labor market will generally be close to equilibrium. On the other hand, if real wages respond sluggishly to disturbances in the labor market, disequilibrium can persist for considerable periods of time. In fact, nominal wage rates generally tend to respond slowly, especially in a downward direction, to disequilibrium in labor markets. In the United States economy for the 1960s and 1970s, the deviation from trend of money wages shows little, if any, relationship to either labor or product market conditions. Thus, wage stickiness, rather than flexibility, characterizes most labor markets in the United States. Several reasons have been cited for this rigidity, including the existence of fixed nominal wage labor contracts, the power of labor unions, and other institutional factors. Regardless of the underlying explanation for this phenomenon, the existence of wage stickiness has significant implications for the macroeconomic adjustment process. The following analysis examines these implications in detail.

Figure 5.1 depicts a situation which is generally described as "full employment" of labor services. Full employment in this sense implies that all individuals who desire to work at the prevailing real wage are satisfied. Unfortunately, this type of situation rarely occurs in our economy. The economy is generally in a state of flux in which various changes in underlying behavioral relationships disturb this desirable equilibrium. Thus, it is useful at this point to discuss the response of the system to a particular disturbance and to carefully examine the adjustment process in the labor market.

Suppose that the current level of income, the interest rate, the nominal wage rate, and the price level imply market clearing in all sectors. For example, the labor market is at an equilibrium such as the one plotted in figure 5.1. Next, assume that this equilibrium is

Figure 5.1 The Aggregate Labor Market



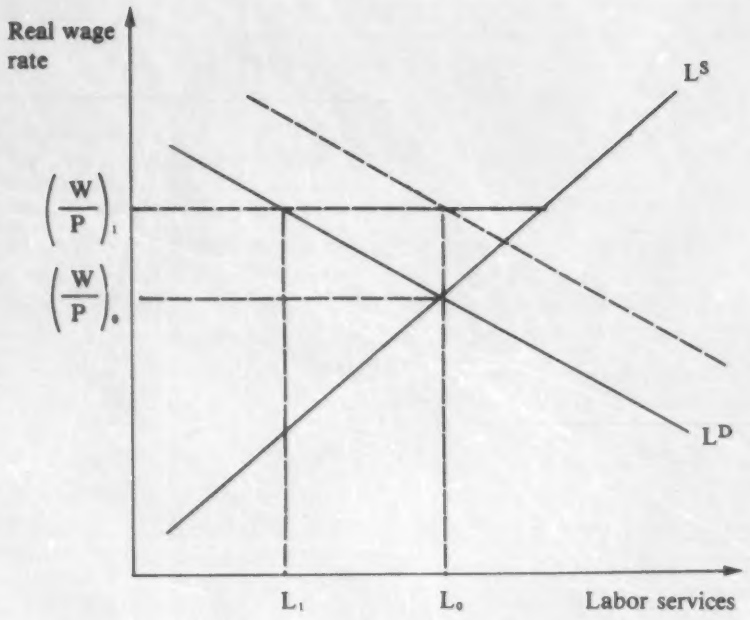
L^D = demand for labor services
L^S = supply of labor services
$\frac{W}{P}$ = real wage rate
L_o = actual employment
$\left(\frac{W}{P}\right)_o$ = market-clearing real wage

disturbed by some underlying change in behavior such that the aggregate demand for commodities decreases.[1] This decrease in aggregate demand exerts downward pressure on the price level, which tends to induce a recovery in demand. In the labor market, the decrease in the price level implies an initial increase in the real wage, such as from $(W/P)_0$ to $(W/P)_1$ in figure 5.2. At this new, higher real wage, the supply of labor services exceeds the demand for labor services. At this point, the excess supply of labor services exerts downward pressure on the nominal wage rate. If the nominal wage rate is completely flexible, then in response to a decrease in the price level (and thus an increase in the real wage) the nominal wage will also fall to restore equilibrium. From figure 5.2 it is evident that the only real wage rate which equates demand and supply is the initial rate, $(W/P)_0$. Consequently, if the nominal wage rate is perfectly flexible, then changes in the price level always result in equiproportionate changes in the nominal wage rate.

This analysis has significant implications for the effects of exogenous demand disturbances on the macroeconomy. Specifically, because the real wage remains unchanged by such disturbances (when nominal wages are flexible), the levels of output and employment are also unchanged. Thus, in a framework where nominal wages are flexible, there is no role for stabilization policy.[2]

As previously noted, nominal wage rates are not flexible, especially in the downward direction. With the use of figure 5.2, it can be shown that nominal wage stickiness implies that downturns in aggregate demand will result in increases in unemployment. Consequently, the existence of sticky wages reintroduces a role for stabilization policies that attempt to offset fluctuations in aggregate demand and employment. Suppose in the preceding example that the nominal wage rate is rigid. In this case, the decrease in aggregate demand and the subsequent decrease in P cause the real wage to rise from $(W/P)_0$ and to be "stuck" at $(W/P)_1$. At this wage rate, the actual amount of employment must be determined according to a market-imposed rule. In this analysis, we impose the rule of *voluntary exchange,* which states

Figure 5.2 Disequilibrium in the Labor Market



L^D = demand for labor services
L^S = supply of labor services
$\frac{W}{P}$ = real wage rate
L_0 = initial level of employment
$\left(\frac{W}{P}\right)_0$ = market-clearing real wage

that no market participant can be forced to either purchase or sell a greater quantity than he wishes to at the currently prevailing wage rate. When the supply of labor exceeds the demand for labor, the principle of voluntary exhange implies that households cannot force firms to purchase more than the quantity of labor services demanded at the current real wage. Thus, in this situation actual employment falls to the quantity of labor services demanded at $(W/P)_1$. The amount of employment in this case is shown in figure 5.2 as L_1. The decrease in actual employment implies a decrease in output, and the economy enters a period of recession.

It is instructive at this point to outline and contrast the strategies of traditional monetary policy with those of employment tax credit policy in response to a downturn in economic activity. With the real wage stuck at $(W/P)_1$ monetary policy acts to lower the real wage by causing an increase in the price level; the monetary authority increases the money supply, thereby creating excess supply in the money market. The resulting decline in the interest rate stimulates investment, and this increase in aggregate demand causes the price level to rise. Thus, monetary policy attempts to stabilize the real wage through changes in the price level.

A possible problem with monetary policy is the indirect nature of its effect on aggregate supply. Monetary policy must first work through the money and commodity markets before having any impact in the labor market. The length of the lag between the initial change in the money supply and the effect of this change on employment can be significant and in fact has been estimated to range between six and eighteen months.[3]

Alternatively, employment tax credit policy has the desirable feature of directly affecting aggregate supply. In figure 5.2, with the real wage fixed at $(W/P)_1$, the fiscal authority, through an increase in the credit rate, would attempt to shift the demand for labor schedule to the dotted position. This change will increase output and employment by lowering the net real cost of labor services. Because the credit has a direct impact on the labor market, this policy can potentially affect output decisions with a minimal lag.

In sum, the analysis shows that the existence of elements of wage stickiness in the aggregate system provides a realistic explanation for fluctuations in output and employment. Consequently, our ensuing analysis incorporates this wage stickiness explicitly by assuming that nominal wage rates adjust slowly in response to disequilibrium in the labor market. Furthermore, the preceding analysis provides a simplistic example of the use of credit policy, which will be useful in our subsequent examination of the effects of the credit.

5.3 The Macroeconomic Consequences of Employment Tax Credit Policy

The primary questions for analysis of any fiscal program are the following: (a) What are the initial effects of the program on individual behavior? (b) What are the macroeconomic consequences of these changes in individual behavior? and (c) Are the macroeconomic consequences of the program affected in a substantive way by the particular scheme chosen to finance the program? This section provides a detailed discussion of each of these questions. We first utilize the conceptual framework already developed to discuss the theoretical implications of wage credit policy.[4] Next, we conduct several numerical calculations to estimate the effects of changes in the credit base and rate on the United States economy.

Conceptual analysis. Consider first the initial effects on employment and output of an increase in the wage credit rate. An increase in the credit reduces the incremental cost of labor and induces firms to increase employment and thus output. The magnitudes of the increases in employment and output depend positively on the demand elasticity of labor. The increase in employment exerts upward pressure on the nominal wage while the increase in output exerts downward pressure on the price level. Because changes in the credit rate imply an increase in profits, and because the firm's increase in employment implies an increase in wage income, disposable income accruing to the household sector rises. The implied increase in household expenditure and thus aggregate demand exerts upward pressure on the price level.

Consequently, an increase in the credit rate increases both aggregate demand and supply. From a theoretical standpoint, therefore, the net effect on the price level is ambiguous. For convenience, the macroeconomic effects of an increase in the credit rate are summarized in figure 5.3.

Alternatively, consider the initial effects of a decrease in the credit base. As discussed in chapter 4, if all firms are currently eligible for the credit, then a decrease in the base has no *direct* impact on employment or output. However, a decrease in the base does increase corporate profits; this again implies increases in disposable income and aggregate demand. The increase in demand causes the price level to rise, and the subsequent decline in the real wage results in an indirect expansion of output and employment. These effects are summarized in figure 5.4. It should be noted that if the decrease in the base allows additional firms to become eligible for the program, then there would be a direct increase in aggregate supply. In this case, the increases in output and employment will be larger than those reported in the table, and the price response will be ambiguous.

Government behavior is also affected by changes in the credit rate or base. An increase in the credit rate or a decrease in the base implies an initial loss of government tax revenue. Because the credit program increases output, however, the tax revenue generated provides an offset to the overall cost of the program. With constant tax rates, it is extremely unlikely that the tax revenue generated by the program would exactly match the overall cost of the program. Thus, the government must choose to accommodate changes in the credit through changes in tax rates, changes in the deficit, or changes in government expenditure. The method of financing has important implications for the macroeconomic effects of the program. The three alternatives for government financing, as previously outlined, will now be analyzed. Each alternative holds constant two of the following three variables: personal income tax rates, the deficit, or government expenditure. The third variable is then adjusted to accommodate the cost of the credit program.

Figure 5.3 Flow Chart of the Macroeconomic Effects of an Increase in the Credit Rate

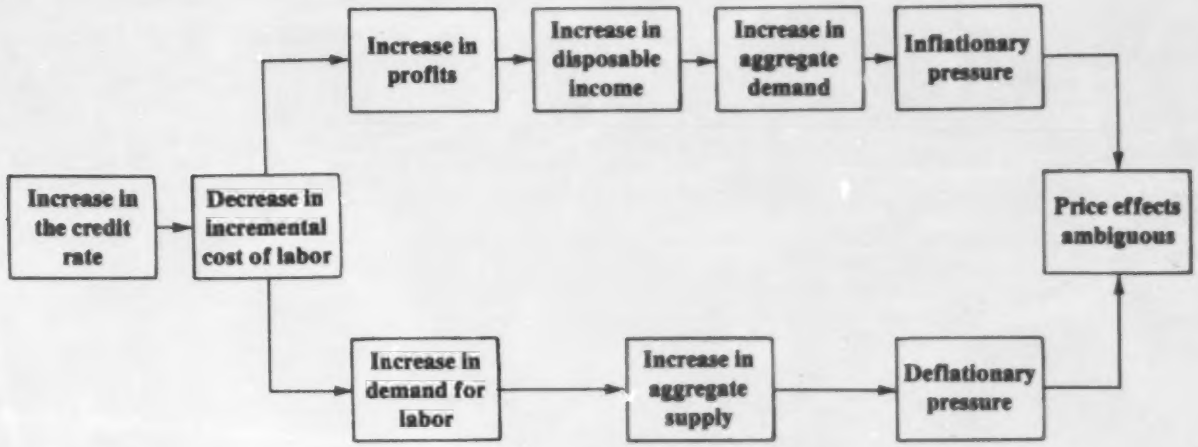


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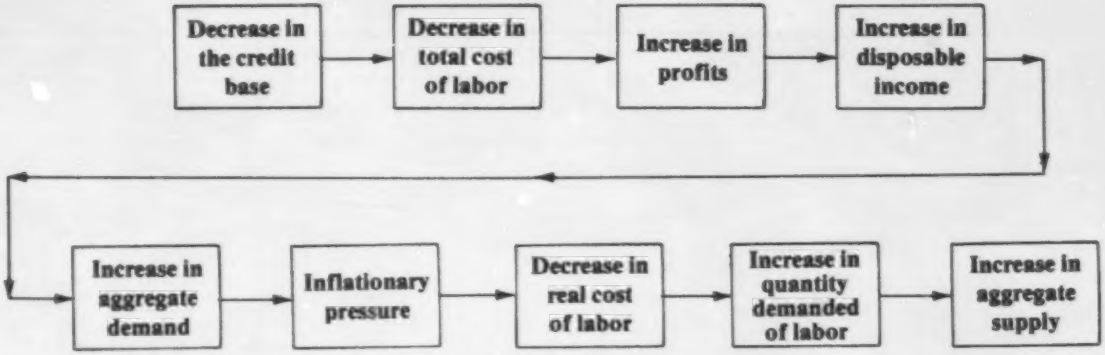
Figure 5.4 Flow Chart of the Macroeconomic Effects of a Decrease in the Credit Base


Decrease in the credit base
Decrease in total cost of labor
Increase in profits
Increase in disposable income
Increase in aggregate demand
Inflationary pressure
Decrease in real cost of labor
Increase in quantity demanded of labor
Increase in aggregate supply

Alternative A. In this situation, government expenditure is fixed, and the deficit is adjusted to accommodate the wage credit. The required adjustment in the deficit depends on the direct and indirect effects of the credit on net tax revenue. The direct effect is a decline in business taxes implied by the increase in the credit. The indirect effects include the increase in revenue associated with increased employment and, possibly, decreased unemployment compensation. Consequently, from a theoretical standpoint, the resultant effect on the size of the deficit is ambiguous.

Table 5.1 summarizes the qualitative results for each financing alternative. Under alternative A, both output and employment increase in response to either an increase in the wage credit rate or a decrease in the program base. For the case of a wage credit rate increase, the price level effect is ambiguous. As previously discussed, the effect of changes in the credit rate on the price level cannot be determined qualitatively because an increase in the credit rate will increase both aggregate supply and aggregate demand. The resulting price response will depend on the magnitude of various demand and supply elasticities.

We can conclude that the larger the program base, the smaller the upward pressure on the price level associated with a given increase in the wage credit rate. A large base means that the credit applies to a relatively small portion of the firm's wage bill. In this situation, an increase in the credit rate increases the firm's profits, and thus household disposable income, by a relatively small amount. Thus, the larger the base of the program, the smaller the effect on consumption expenditure for any given change in the credit rate. Consequently, under deficit financing, increases in the credit rate are more likely to be deflationary the larger the program base.

Table 5.1 also shows that under alternative A, a decrease in the base of the program with a given wage credit rate implies an unambiguous increase in the price level. In this case, the decrease in the base acts directly to stimulate aggregate demand. The resulting price increase, and decrease in the real wage, will stimulate output. Consequently, decreases in the base have

Table 5.1 Macroeconomic Effects of Changes in the Wage Credit and Base on Employment, Output, and Prices

Response / Financing strategy	Credit rate increase			Base decrease		
	Employment	**Output**	**Price level**	**Employment**	**Output**	**Price level**
Alternative A Deficit financing with government expenditure and income tax rates unchanged	Increase	Increase	?	Increase	Increase	Increase
Alternative B Government expenditure reduced by the full cost of the wage credit	Increase	Increase	?	Decrease	Decrease	Decrease
Alternative C Personal income taxes adjusted to cover the full cost of the credit	Increase	Increase	Decrease	No change	No change	No change

indirect effects on output and employment through price changes. Again, if the decrease in the base allows more firms to become eligible for the program, then the resultant direct increase in aggregate supply will imply ambiguous price effects and will increase the output and employment effects.

Alternative B. The budget strategy implied by alternative B involves reducing government spending, presumably on employment-generating programs, to offset the revenue loss that may be associated with the wage credit. This strategy is potentially advantageous if the goal of the program is to stimulate private employment at the expense of public employment. Under this strategy, there is a move to nullify the aggregate demand increase that follows from the windfall increases in business income. There is also an attempt to eliminate any increase in the deficit that develops from the reduction in tax receipts.

Table 5.1 indicates identical qualitative responses to changes in the credit rate under alternatives A and B for employment, output, and the price level. Table 5.1 also indicates that the qualitative results for changes in the program base are exactly opposite under these two alternatives. The explanation for these results centers on the initial effects of the base change on aggregate demand. Under both alternatives, a decrease in the level of the base tends to stimulate aggregate demand by increasing disposable income and thus, consumption spending. Under deficit financing, this increase in demand increases prices and precipitates an increase in output. In contrast, under alternative B, the decrease in government expenditure that accompanies the wage credit more than offsets the increase in consumption expenditure. Specifically, the government decreases expenditure by the exact amount of the loss in tax revenue associated with the program. Thus, the decrease in government expenditure is exactly equal to the initial increase in firm profits (the tax savings) implied by the increase in the credit. Households receive this increase in profits net of taxes through dividends; however, consumption expenditure increases by only a fraction of the increase in income. Consequently, the decrease in government expenditure implies an overall net decrease in aggregate demand. The subsequent decline in the price level

increases the real cost of labor services and results in a decrease in employment and output. In this case, if the decrease in the base allows additional firms to become eligible for the program, then the resultant direct increase in aggregate supply will imply ambiguous output effects. However, for small changes in the base, the increase in the number of firms eligible for the program is likely to be small, and thus, the output effects are likely to be negative under alternative B.

Alternative C. This strategy of finance holds nominal government expenditure and the deficit constant, and adjusts the personal income tax rate, so as to maintain a balanced federal budget. Under alternative C, it develops that the increase in the personal income tax rate sufficient to maintain net government revenue will exactly offset the impact on aggregate demand of an increase in the wage credit: the increase in disposable income is exactly equal to the cost of the program. This implies that net disposable income remains unaffected by joint imposition of the wage credit and the increase in the personal tax rate.

Because aggregate demand does not change in response to changes in the wage credit rate, the full reaction to the program develops on the supply side of the economy. The increase in the credit rate induces an increase in output and employment. In this case, the increase in output implies an unambiguous decrease in the price level. This decrease stimulates aggregate demand sufficiently to absorb the increase in output. The third line of table 5.1 summarizes this case. Note that changes in the base under alternative C also have exactly offsetting effects on aggregate demand. Furthermore, because the base does not directly affect supply, changes in the base for a constant wage credit rate have no impact on the macroeconomy.

Comparison of employment tax credit policy with traditional monetary and fiscal policies. The preceding analysis shows that employment tax credit policy can be used to stabilize output and employment. Traditional monetary and fiscal policies, however, can also be used for this purpose. The macroeconomic policy maker has available several alternatives that can accomplish the

same stabilization goal. The choice between these alternatives depends to a large extent on the following considerations: (1) the length of the lag between the implementation of the policy and its effect on employment; (2) the inflationary consequences of the policy; and (3) the practical difficulty associated with implementing the policy.

In general, we can compare the response lag and inflationary consequences of different macroeconomic policies by examining the transmission mechanism of each policy tool. As described, the employment tax credit is basically a supply-side management tool. By directly affecting the real cost of labor, a change in the credit rate immediately affects employment and output. In contrast, traditional macroeconomic policies are demand-side management tools. These policies only indirectly affect aggregate supply through changes in aggregate demand and the price level. Changes in the price level in turn affect the real cost of labor and thus induce changes in employment.

It is interesting to contrast the use of traditional policies with that of employment tax credit policy during a recessionary period following a decline in aggregate demand. Traditional policies act to stimulate demand and thereby increase the price level. This increase in the price level, assuming some wage rigidity, lowers the real cost of labor services and induces employers to increase employment and output. Alternatively, the employment tax credit directly increases the demand for labor and thus stimulates output and employment. By directly affecting the real cost of labor, the employment tax credit can potentially circumvent some of the response lags associated with demand-side management policies. The impact of the employment tax credit program could be dampened by the existence of a long recognition lag (between the time the credit is implemented and the time firms become aware of the program). This type of lag generally exists for most fiscal subsidies but can be minimized by a strong commitment to publicizing the program. Furthermore, in contrast to traditional policies, the employment tax credit can increase output and employment without precipitating a rise in prices. In fact, by

directly stimulating supply, the credit tends to exert deflationary pressure on the system.

It is also useful to examine the efficacy of these strategies during a downturn in business activity resulting from an aggregate supply shock to the economy. For example, in recent years the energy and raw materials crisis, the devaluation of the dollar, and various demographic changes have caused short term changes in the level, or at least the growth, of aggregate supply. In the context of our model, a decrease in aggregate supply and output results in simultaneous increases in the price level and the level of unemployment. Traditional demand-management policies that seek to stabilize the economy must do so by inducing price increases and lowering the real wage. Thus, to stabilize output, the rate of inflation must increase. In contrast, the employment tax credit directly increases employment and real output, without an increase in the price level. Thus, the employment credit initiated in response to a decrease in aggregate supply can actually lower the inflation rate while simultaneously stimulating employment and output.[5] In general, the response lags are potentially shorter and the inflationary consequences are less severe for employment tax credit policy than for traditional macroeconomic policies.

Consider next the possible implementation problems associated with employment tax credit policy. Admittedly, because of the political process, the administration of any short term fiscal program is difficult. In this regard, there may be some reason to prefer traditional monetary policy that can be implemented with a degree of autonomy. With this implementation lag in mind, some legislative proposals have suggested that the employment tax credit be automatically set to accord with an aggregate measure of excess capacity. Senator Dole, for example, suggested a program that would progressively link the credit rate to the rate of unemployment, with the credit disappearing when the unemployment rate declines below 6 percent. The legislation suggested by Senator Bentsen would have the eligibility base of the credit adjust to labor market conditions. In principle, at least, such an automatic triggering of the credit would overcome some of the implementation lags that are common to fiscal policy measures.

In summary, conceptual analysis reveals a number of qualitative properties of employment tax credit policy. The analysis indicates unambiguous positive responses of employment and output to increases in the credit rate. Also, the employment, price level, and output responses to changes in the base are established for each alternative financing strategy of the government. On the other hand, a number of important responses, including the price level response to increases in the wage credit rate, cannot be qualitatively established for each alternative of finance. The ambiguous responses result from the joint impact of aggregate demand and supply associated with the employment credit. In the next section, numerical calculations are developed for the employment, output, and price level responses to an increase in the credit rate and base.

5.4 Estimates of the Impact of a Wage Credit on the United States Economy

The numerical calculations presented in this section measure the impact on employment and other macroeconomic variables of a wage credit program implemented for several bases and for the selected financing strategies described earlier. These estimates are obtained by using realistic parameter values in the behavioral relationships of our macroeconomic framework. In addition, we calculate average tax and unemployment compensation rates, corporate profits, and other relevant values from the national income accounts for 1976. The use of 1976 data allows analysis of the likely effects of the credit program had it been implemented during that year.[6]

A limitation of these estimates is the use of a single, homogeneous measure of employment; our analysis assumes that all sellers of labor services and all firms are identical. A more realistic analysis would include heterogeneous combinations of labor markets and firms.[7] This expanded framework would allow analysis of different labor markets, some of which may be in excess supply, others in excess demand, and still others clearing at any specific point in time. In a heterogeneous economy, regardless of the state of the aggregate system, there will always be some

firms which are expanding while others are contracting. If the base of the program is relatively high, then it is likely that some of the firms which are currently reducing employment will not be eligible for the program.[8] Therefore, because our calculations assume that all firms are eligible for the program, there is a tendency to overestimate the employment response to an increase in the wage credit when the base is relatively high. To adjust for this effect, all of the following calculations utilize a conservative estimate of the elasticity of the demand for labor, which implies a conservative estimate of the aggregate employment response to the credit program. In this manner we allow for the possibility that in a more realistic framework some firms may not be eligible for the program.

Table 5.2 provides estimates of the percentage changes that result from full adjustment of the aggregate system to a 1 percent increase in the wage credit rate. The estimates are presented for three base levels and for the three alternatives of financing. The first row under alternative A, for example, indicates that a 1 percent wage credit with a zero base (all man-hours are eligible) will increase employment by .109 percent, the price level by .183 percent, and the deficit by .460 percent of the original level of tax receipts.

In general, the figures in table 5.2 indicate that an increase in the credit rate results in an increase in employment (and output) for all base percentages and all strategies of finance. In addition, the credit increase is generally deflationary, except when financed through deficit spending at low base levels. The table also allows easy comparison of the relative effects on the system of different financing schemes and different base levels. For most base levels, deficit spending, alternative A, implies a greater expansion of output and is less deflationary than the other two alternatives. The essential idea is that, with alternatives B and C, either a decrease in government expenditure or an increase in the tax rate directly reduces aggregate demand. This reduction in demand dampens the ability of the system to absorb increases in output and thus exerts deflationary pressure in the commodities market. In contrast, an increase in deficit spending has no immediate dampening effect on

Table 5.2 The Full Impact on the United States Economy of a 1 Percent Increase in the Wage Credit (Percentage Changes)

Alternative A - Deficit financing with government expenditure and income tax rates unchanged

Base percentage	Employment	Output	Price	Deficit
.00	.109	.066	.183	.460
.95	.097	.059	-.045	.057
1.00	.097	.059	-.057	.036

Alternative B - Government expenditure reduced by the full cost of the wage credit

Base percentage	Employment	Output	Price	Deficit
.00	.074	.045	-.526	-.347
.95	.095	.058	-.088	.009
1.00	.097	.059	-.064	.028

Alternative C - Personal income taxes adjusted to cover the full cost of the credit

Base percentage	Employment	Output	Price	Tax rate
.00	.096	.058	-.077	.351
.95	.096	.058	-.077	.044
1.00	.096	.058	-.077	.028

Note: The most significant parameter in the numerical calculations is the elasticity of demand for labor, which is assumed to be equal to -.1 in Tables 5.2, 5.3, and 5.4. In Appendix B, we present estimates based on an elasticity of demand for labor equal to -.36.

aggregate demand, and deflationary pressure results only from the supply side of the economy. Consequently, for most base percentages, alternatives B and C result in more deflationary pressure in the system and less expansionary pressure than does alternative A.

The main implication of the preceding discussion is that the choice of method to finance the credit should depend in part on the severity of the recession. For example, suppose the fiscal authority chooses to implement the credit program with a 95 percent base. During a mild recession, when the policy objective is to moderately expand employment without creating excessive inflationary pressure, table 5.2 implies that alternatives B and C would be superior to alternative A. In contrast, during a severe recession, alternative A would be superior due to its somewhat more expansionary effect on output.

The figures in the last column of table 5.2 are indicators of the overall net cost to the government of the credit program. The last column for alternatives A and B represents the percentage increase in the government deficit, measured as a percentage of tax receipts. The last column for alternative C measures the increase in the income tax rate required to maintain a constant level of net tax revenue. Examination of alternatives A and C reveals that lower-based programs require either a larger increase in the deficit or a larger tax rate increase than higher-based programs. In other words, the larger the portion of the wage bill to which the credit applies, the more costly the program in terms of deficit or tax rate changes.

It is useful at this point to consider the likely effects on the United States economy if an employment tax credit had been implemented in 1976. Table 5.3 provides a summary of these results. The first row in this table shows the actual 1976 values for employment, output (percentage change), the price level (percentage change), and government variables. The remaining rows show estimates of the changes that would have occurred if a 10 percent credit with a 95 percent base had been introduced in 1976. These estimates are again presented for the three financing alternatives.

Table 5.3 Estimated Impact on the United States Economy in 1976 of an Employment Tax Credit Program

	Aggregate variables				
	Employment (thousands)	Percentage change in real GNP	Percentage change in price level (GNP deflator)	Deficit (billions)	Average personal income tax rate
Actual 1976 data	**79,443**	**6.00**	**5.1**	**$35.6**	**15.81**
Estimated effects of a 10 percent credit with a 95 percent base					
Alternative A Deficit financing with government expenditure and income tax rates unchanged	80,217	6.59	4.6	$38.6	*
Alternative B Government expenditure reduced by the full cost of the wage credit	80,201	6.58	4.2	$36.1	*
Alternative C Personal income taxes adjusted to cover the full cost of the credit	80,208	6.58	4.3	*	16.25

*No change by specification of the models.

The figures in table 5.3 indicate that the credit program would have significantly increased employment in 1976. Under all three financing alternatives, the estimated impact of the credit on employment is slightly greater than 750 thousand additional jobs (subtracting actual employment from estimated employment under the three alternatives). Furthermore, the estimates show that the credit program would have increased the growth rate of real output to above 6.5 percent from the actual rate of 6 percent. The table also indicates that, as discussed, alternative A, deficit spending, has a (slightly) greater impact on employment and output than do the other financing alternatives. With respect to the rate of inflation, the table implies that the credit program would have slowed the rate of increase in the price level. As expected, the decrease in government expenditure, alternative B, exerts the greatest downward pressure on the rate of inflation.

Table 5.4 illustrates the impact of the credit on various components of the government budget. Under alternative A, the increase in tax revenue plus the reduction in unemployment benefits covers almost half the cost of the credit. The remaining cost is financed by the increase in the deficit. Under alternative B, tax revenue falls, but because government expenditure is reduced by the full cost of the employment tax credit program, the increase in the deficit is smaller than under alternative A. Under alternative C, the method of government financing requires that increases in tax revenue exactly cover the difference between the cost of the credit and the reduction in unemployment benefits.

Several studies of employment-creating programs calculate the "cost per job" in terms of the lost tax revenue or increased government expenditure implied by the implementation of the program. For example, a recent study by Johnson and Tomola (1977) computes the cost per job for several alternative job-creating programs. For an increase in direct government expenditures, their estimates indicate a cost per job equal to $18,600 after four quarters; for a tax cut, a cost per job of $21,200 after four quarters; and for a program of public service employment, a cost per job of $14,500 after four quarters.

Table 5.4 Estimated Impact on the Deficit and Estimated Cost per Job of a 10 Percent Credit with a 95 Percent Base

	Change in tax revenues	Reduction in unemployment benefits	Employment tax credit	Reduction in government expenditures	Increase in deficit	Cost per job*
	(billions of dollars)					(dollars)
Alternative A Deficit financing with government expenditure and income tax rates unchanged	1.10	1.66	5.79	0	3.03	3,915
Alternative B Government expenditure reduced by the full cost of the wage credit	-2.09	1.62	5.76	5.76	.47	8,219
Alternative C Personal income taxes adjusted to cover the full cost of the credit	4.13	1.63	5.76	0	0	0

*See text for definition.

In the present analysis, if the credit is deficit financed (alternative A), then the cost per job is obtained by dividing the $3.03 billion increase in the deficit by the 774 thousand (calculated from table 5.3) new jobs. The resultant cost per job is equal to $3915. Under alternative B, the credit (and thus additions to employment) , is financed by reducing government expenditure. Consequently, the cost per job equals the change in government expenditure plus the change in the deficit divided by the number of new jobs. As indicated in table 5.4, this calculation results in a cost per job equal to $8219. Finally, alternative C is neutral with respect to its impact on the government budget. In this case, the cost to the government is zero as the tax burden is shifted from businesses to households.

Based on the estimates of Johnson and Tomola and of this study, the employment tax credit program appears to be the least costly fiscal method of stimulating employment. The reasons for this result are straightforward. First, for public expenditure programs, the entire cost of each new job is borne by the government. In contrast, firms pay part and generally most of the cost of jobs created through the credit program. Second, a decrease in taxes is a traditional demand-side management policy which must stimulate aggregate demand, increase prices, and work through the labor market to affect the demand of firms for labor. Consequently, each dollar of the traditional tax cut only indirectly affects aggregate supply. As a result, the employment tax credit is more cost efficient through its direct effect on aggregate supply and employment.

NOTES

1. For example, due perhaps to pessimistic expectations of future economic activity, firms could decrease investment, or households could decrease consumption while choosing to save a greater fraction of income.

2. The conclusions are essentially those of the classical framework, which was criticized by Keynes (1936) on a number of grounds, including the unrealistic assumption of flexible nominal wages.

3. See Friedman (1959) for a detailed discussion of these lags.

4. A detailed discussion of the complete macroeconomic model is presented in Appendix A.

5. This result is analyzed in detail by Fethke and Policano (1977).

6. A detailed presentation of this methodology can be found in Appendixes A and B.

7. To some extent, the estimates constructed by Bishop (1977) and Hamermesh (1977) analyze this case.

8. As discussed in chapter 4, there is also some concern that firms already expanding when the program is implemented will receive a windfall profit.

APPENDIX A

APPENDIX A

The response of employment to a wage credit increase ultimately depends on the short term reactions of firms to a reduction in labor cost, the indirect impact on employment of wage credit initiated changes in aggregate demand, and the strategy selected by the government to finance the program. It is necessary, therefore, to develop an aggregate model that accommodates all of these factors. The notable features of our aggregate formulation are the following: (1) a general wage credit program with a flexible base is incorporated into the model; (2) several forms of the government budget constraint are considered; and (3) the labor and commodity markets adjust to changes in demand and supply conditions. The model consists of ten technical and behavioral equations.

Aggregate demand is represented as follows (time subscripts are suppressed for notational convenience):

$$(1)\ Y = C(Y_d) + I(i) + \frac{G}{P}$$

where $PY_d = (1\text{-}t\text{-}x)WL + (1\text{-}t)(1\text{-}T)\pi + b(L_F\text{-}L) + A$, and

$$\pi = Py(1\text{-}v) - WL[1 + z\text{-}s(1\text{-}\frac{B}{L})],$$

with $0 < \frac{\partial C}{\partial Y_d} < 1$, and $\frac{\partial I}{\partial i} < 0$. The variables are defined as follows: Y = aggregate demand, C = consumption, Y_d = disposable income, I = gross investment, i = the rate of interest, G = government spending, W = the nominal wage, L = employment, π = business income, L_F = the full employment work force, A = other transfer payments, P = the price level, y = the real level of sales, and B = the employment base of the credit program. The parameters are the following: t = the personal income tax rate, x = the employee payroll tax rate, T = the business profit tax rate, b = the average unemployment benefit, v = the indirect business tax rate, z = the employer payroll tax rate, and s = the wage credit rate.

Disposable income accrues to the households in three forms: (1) wage income net of income and payroll taxes, $(1 - t - x)WL$; (2) profit income net of income and corporate taxes, $(1 - t)(1 - T)\pi$; and (3) non-taxed unemployment benefits, $b(L_F - L)$, and other transfers. Business income equals sales net of indirect business taxes, $Py(1 - v)$, minus net labor costs, $WL[1 + z - s(1 - \frac{B}{L})]$.

The wage credit, $s(1 - B/L)$ is represented as a percentage reduction on the wage bill for all employees above a prescribed base level, with the entire credit subject to business income taxes. When $B = 0$, the program is a payroll credit on all employment; when $B = L$, the credit is offered on net increments to the wage bill; other cases arise for $0 < B < L$. Investment in equation (1) responds inversely to the interest rate. Government expenditure depends on the particular strategy selected to finance the program, that is, on the nature of the government budget constraint.

Three alternatives are considered for describing the nature of the government budget constraint:

(2a) $G = \bar{G}$ with D flexible,

(2b) $G = \bar{G} - Ws(L - B)$, and

(2c) $G = \bar{G}$ and $D = \bar{D}$ with t endogenous.

The first case (2a) assumes that government expenditure is exogenously determined and the deficit, D, adjusts to accommodate changes in net tax revenue that develop as a consequence of the wage credit. The second case (2b) involves reducing government spending by the full cost of the wage credit. Finally, the third case (2c) consists of increasing the personal income tax rate to offset the revenue loss of the wage credit program. While not exhausting the possibilities, these three strategies provide interesting contrasts from which to view the implications of the wage credit program.

The money market is always in equilibrium and is represented by

(3) $M^D(Y,i) = \frac{M^S}{P}$ with $\frac{\partial M^D}{\partial Y} > 0$ and $\frac{\partial M^D}{\partial i} < 0$.

An increase in aggregate demand will increase the demand for money, M^D, while an increase in the interest rate decreases the demand for money. The nominal supply of money, M^S, is exogenous.

On the supply side, real output, Q, is a function of variable labor:

$$(4)\ Q = F(L) \text{ with } \frac{dF}{dL} > 0,\ \frac{d^2F}{dL^2} < 0.$$

The usual assumptions are made regarding the properties of F(L). With regard to capital, the presumption is that the lead time required to change the level of capital is sufficiently long such that the capital stock may be regarded as fixed.

The demand for labor is a function of the real cost of labor, that is, the real wage rate adjusted for payroll taxes and the effective wage credit rate:

$$(5)\ L^D = L^D[W(1+z-s)/P] \text{ with } \frac{\partial L^D}{\partial W} < 0,\ \frac{\partial L^D}{\partial P} > 0,$$

$$\frac{\partial L^D}{\partial S} > 0 \text{ and } \frac{\partial L^D}{\partial z} < 0.$$

The demand for labor function presumes that firms seek to maximize profit and that the program base is set so as to make the wage credit effective. Note that the credit is offered to firms that increase employment beyond a base level rather than to households as an income supplement, as in Barth (1974) or Kesselman (1969).

Labor supply depends positively on the wage level and inversely on the aggregate price level:

$$(6)\ L^S = L^S(W,P) \text{ with } \frac{\partial L^S}{\partial W} > 0 \text{ and } \frac{\partial L^S}{\partial P} < 0.$$

There is the possibility of money illusion if the elasticity of labor supply with respect to the wage, $\sigma = \frac{\partial L^S}{\partial W} \cdot \frac{W}{L^S}$, exceeds the negative of the labor supply elasticity with respect to the price

level, $\alpha = \frac{\partial L^S}{\partial P} \cdot \frac{P}{L^S}$. We assume that $\sigma \geq -\alpha$. The absolute values of the elasticity of supply of labor with respect to the wage rate is assumed to exceed the absolute value of the elasticity of supply of labor with respect to the price level. This assumption implies a degree of money illusion on the part of households.

A degree of wage and price stickiness is presumed to exist in the system. In the labor market, the percentage rate of change of real wages depends positively on the difference between labor demand and supply.

$$(7)\ \frac{\dot{W}}{W} = g(L^D - L^S) + \lambda \frac{\dot{P}}{P}, \text{ with } g(0) = 0 \text{ and}$$

$$g'(L^D - L^S) > 0,$$

where $\dot{W} = \frac{dW}{dt}$. The function $g(L^D - L^S)$ reflects various adjustment costs associated with the movement of labor demand and supply. The parameter $0 < \lambda < 1$ reflects the degree of money illusion in the system. The rationale for equation (7), which can be interpreted as a Phillip's curve with unitary price expectations, is recently reviewed by Brinner (1977).

Labor market transactions can occur when the labor market is not in equilibrium. The actual level of employment is determined as the minimum of labor demand and supply:

$$(8)\ L = \min(L^D, L^S).$$

Equation (8) reflects the voluntary exchange rule, which states that no market participant can be forced to either purchase or sell a greater quantity than he wishes at the current real wage. For example, when labor supply exceeds labor demand, the principle of voluntary exchange implies that households cannot force firms to purchase more than the quantity of labor services demanded.

Similarly, disequilibrium can also develop in the commodity market. Here the rate of change in the price level will depend on the difference between real demand and output:

$$(9)\ \frac{\dot{P}}{P} = f(Y - Q) \text{ with } f(0) = 0 \text{ and } f'(Y - Q) > 0.$$

An increase in excess demand, $(Y - Q) > 0$, will increase the rate of inflation. Since sticky prices prevent immediate clearing of the commodity market, the actual level of sales is determined by the minimum of real aggregate demand and real output, that is,

$$(10)\quad y = \min(Y, Q).$$

This rule expresses the voluntary exchange principle in the commodity market.

To summarize, the wage credit rate, s, has a direct effect on several aggregate variables. First, an increase in the credit rate, or a reduction in the base, increases business income and, thereby, affects consumption expenditures of households. Second, an increase in the credit will initiate a shift in labor demand. Finally, depending on the strategy of finance, the credit may directly affect government expenditures and revenue. The complete reaction of the system to a wage credit depends, however, on the full interaction of labor, commodity, and financial markets.

APPENDIX B

The numerical analysis discussed in chapter 5 is based on the aggregate model presented in Appendix A. We choose specific functional forms for the behavioral equations and use realistic values for the relevant parameters. In addition, initial values for the endogenous variables are based on 1976 data. This formulation allows an investigation of the likely effects on the United States economy had an employment credit program been implemented in 1976. These estimates differ from those presented in Fethke and Williamson (1976b). The differences stem from the adoption, for these estimates, of a constant elasticity of substitution (CES) production function rather than the Cobb-Douglas production function, the inclusion of price-level induced changes in the interest rate through the money market, and the use of a more complete set of tax parameters.

Aggregate demand is the sum of consumption, investment, and government expenditures. (We exclude the net export component of aggregate demand due to its relatively small magnitude—less than one-half of one percent of GNP in 1976.) Consumption is assumed to be a linear function of disposable income,

$$C = C_o + \gamma Y_d \text{ with } C_o \text{ and } \gamma \text{ both} > 0.$$

The level of investment depends on the interest rate but is not directly affected by the implementation of the credit program. Changes in the credit rate and base can indirectly affect investment by causing price changes that work through the money market to affect interest rates.

The level of output is a CES production function where E is the scale factor, δ is the distribution parameter, and ρ is the substitution parameter:

$$Q = E[(1 - \delta)L^{-\rho} + \delta K_o^{-\rho}]^{-1/\rho}.$$

Capital stock, K_o, is assumed fixed.

The demand for labor can be derived from the production function by setting the real marginal cost of labor services, $\frac{W}{P}(1 + z - s)$, equal to the marginal product of labor, $\frac{(1 - \delta)}{E^{\rho}} \left(\frac{Q}{L}\right)^{\rho+1}$. This calculation yields

$$L^D = Q\left[\frac{E^{\rho}}{1 - \delta}\left(\frac{W(1 + z - s)}{P}\right)\right]^{\frac{-1}{1 + \rho}}.$$

The elasticity of the demand for labor with respect to the real wage, e_W^D, is given by

$$e_W^D = -\frac{1}{1 + \rho}\,\frac{1}{1 - S_L},$$

where $S_L = \frac{WL}{Y(1 - v)}$ is the share of Y that accrues to wage earners.

The labor supply function is given by

$$L^S = qW^{\sigma}P^{\alpha},$$

where σ is the constant elasticity of labor supply with respect to the nominal wage, α is the constant elasticity of labor supply with respect to the price level, and q is a positive constant. If $\alpha = 0$, then there is complete money illusion and price changes have no effect on labor supply. If $\alpha = -\sigma$ then $L^S = q\left(\frac{W}{P}\right)^{\sigma}$ and labor supply depends solely on the real wage.

The parameter values used in the numerical calculations are drawn from the estimates of Lucas and Rapping (1970), Black and Kelejian (1970), Kesselman, Williamson, and Berndt (1977), the *Survey of Current Business,* the *Social Security Bulletin,* and other well-known sources. The particular values are the marginal propensity to consume = Y = .8, the elasticity of demand for labor with respect to the real wage = $e_W^D = \{-.1, -.36\}$, the elasticity of supply of labor with respect to the nominal wage = σ = 1.5, the elasticity of labor supply with respect to the price level = α = -.75, the elasticity of demand for investment with respect

to the interest rate = -1.0, the interest elasticity of demand for money = -.5, and the elasticity of demand for money with respect to real income = 1.

The average tax and benefit rates used in the calculations are the personal income tax rate = t = .16, the business profit tax rate = T = .41, the employee payroll tax rate = x = .06, the employer payroll tax rate = z = .07, the indirect business tax rate = v = .10, and the ratio of the average unemployment benefit to the nominal wage = b/W = .18. These figures are the average effective rates constructed from tax revenue data and are reasonably representative of the United States economy. The numerical calculations are sensitive to the value selected for the elasticity of demand for labor. The numerical calculations reported in the text (tables 5.2, 5.3, and 5.4) assume that $e_W^D = -.1$, which, based on the available literature, is a conservative estimate. On the other hand, table B.1 reports estimates of the percentage responses to a 1 percent wage credit when $e_W^D = -.36$. While the qualitative responses of employment, output, and the price level are the same as those in table 5.2, the quantitative responses are quite different. Specifically, when $e_W^D = -.36$, the employment response for each case is approximately three times the employment response that develops when $e_W^D = -.1$. Also, the price response when $e_W^D = -.36$ is more deflationary than when $e_W^D = -.1$. In general, variation in the other elasticities does not change the results significantly.

Table B.1 The Full Impact on the United States Economy of a 1 Percent Increase in the Wage Credit (Percentage Changes)

Alternative A - Deficit financing with government expenditure and income tax rates unchanged

Base percentage	Employment	Output	Price	Deficit
.00	.339	.205	.048	.545
.95	.304	.184	-.167	.133
1.00	.302	.183	-.178	.110

Alternative B - Government expenditure reduced by the full cost of the wage credit

Base percentage	Employment	Output	Price	Deficit
.00	.230	.139	-.629	-.302
.95	.296	.179	-.220	.067
1.00	.299	.181	-.198	.086

Alternative C - Personal income taxes adjusted to cover the full cost of the credit

Base percentage	Employment	Output	Price	Tax rate
.00	.293	.177	-.236	.407
.95	.293	.177	-.236	.100
1.00	.293	.177	-.236	.084

Note: The elasticity of demand for labor (e_w^D) is assumed to be equal to -.36.

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Related Research

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